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Proceedings of the Fourteenth Meeting of the Advisory Board of the Imperial Council Agricultural Research

Held at Simla on the 13th, 16th, 17th & 18th July 1936.

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Schedule of papers circulated to the members of the Advisory Board of the Imperial Council of Agricultural Research for its fourteenth meeting held at Simla, on the 13th, 16th, 17th and 18th July 1936.

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Agenda for the Meeting of the Advisory Board of the Imperial Council of Agricultural Research held at Simla from the 13th to 18th July 1936.

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1. (*a*) Decisions of the Governing Body on the recommendations of the Advisory Board made in February 1936.

(*b*) Appointment of Committees.

2. Address by Sir William Stampe, Kt., C.I.E., Chief Engineer to Government, United Provinces, on the development of the use of underground water supplies and hydro-electric developments in the United Provinces with special reference to sugarcane cultivation.

3. Reports of the three sub-committees appointed to consider the draft Briefs for Experts in connection with the scientific survey of the work in progress and contemplated under the auspices of the I. C. A. R.

4. Village enquiry regarding cattle and the production and consumption of milk.

5. Application from the Government of the Punjab for a grant of Rs. 29,000 for sending an officer of the Punjab Veterinary Service, Class I, on deputation to South Africa to study the Angora Goat Breeding Industry.

6. Application from the Government of Travancore for a grant of Rs. 2,89,136 spread over ten years for a scheme for improving the cattle in the west coast of India.

7. Application from the Government of Bombay for a grant of Rs. 41,075 spread over five years for a scheme of research in economic ornithology by Mr. A. Salim Ali.

8. Report of the Sugar Committee :—

A.—PROGRESS REPORTS ON RESEARCH SCHEME.

(*i*) Cancelled.

(*ii*) Progress report on the working of the Sugarcane Research Station in the Bombay-Deccan, Padegaon, for 1934-35.

(*iii*) Progress report on the Sugarcane Seedling Testing Station at Dacca for 1934-35.

(*iv*) Progress report on the Sugarcane Research Scheme in the United Provinces (Shahjahanpur and Muzaffarnagar) for 1934-35.

(*v*) Progress report on the work of the Sugarcane Research Station at Mushari (Bihar and Orissa), for 1934-35.

(*vi*) Cancelled.

(*vii*) Progress report on sugarcane work at the Jorhat Experiment Station, Assam, during 1934-35.

(*viii*) Report of work done on the breeding of thick canes in Mysore at the Hebbal Farm, Bangalore, and Irwin Canal Farm, Mandya, for 1933-35.

(*ix*) Progress report on investigations on the mosaic and other diseases of sugarcane for 1934-35.

(*x*) Cancelled.

(*xi*) Progress report for 1935-36 on the work of the sugarcane research station at Mushari (Bihar and Orissa).

(*xii*) Reports on the work done under the scheme for research on the genetics of sugarcane, from May 1934—July 1935, and July 1935 to March 1936.

(*xiii*) Annual report of the sugarcane research scheme in the Punjab for 1934-35 and 1935-36.

(*xiv*) Progress report of the sugarcane sub-station, Karnal, for 1935-36.

B.—GENERAL.

(*i*) Review of the quality of sugar manufactured in India by central sugar factories and refineries during the season 1935-36.

(*ii*) Report on the working of the Bureau of Sugar Standards for 1935-36.

(*iii*) Report on the utilisation of the bagasse for the paper and board industry by Mr. M. P. Bhargava, Officer-in-Charge, Paper Pulp Section, Forest Research Institute, Dehra Dun.

(*iv*) Recommendation of the Crop Planning Conference, 1934, regarding the extension of sugarcane cultivation in India.

C.—PROPOSALS FOR EXTENSIONS OF SUGAR RESEARCH SCHEMES.

(*i*) Application from the Director, Imperial Institute of Agricultural Research, for Rs. 1,11,000 spread over five years for the continuation of research on mosaic and other diseases of sugarcane.

(*ii*) Application from the Government of Bombay for Rs. 4,24,400 spread over five years for the continuance of the sugarcane research scheme in the Bombay-Deccan.

(*iii*) Application from the Government of Bihar for a grant of Rs. 1,49,150 spread over five years for the extension of the sugarcane research scheme for five years from March 1937.

D.—PROPOSALS FOR NEW SUGAR RESEARCH SCHEMES.

(*i*) Application from the Government of H. E. H. the Nizam of Hyderabad for Rs. 31,535 spread over five years for a scheme of sugarcane research in Hyderabad.

9. Progress reports on Animal Husbandry schemes :—

(*i*) Annual reports of Veterinary Investigation Officers in the Provinces (except North-West Frontier Province) and in Hyderabad State for 1935-36.

(*ii*) Annual report for 1935-36 on the Johne's disease investigation scheme in Mysore.

(*iii*) Annual report for 1935-36 on the Central Provinces Goats Virus vaccination scheme.

(*iv*) Annual report for 1934-35 on the Punjab Parasitological scheme.

(*v*) Annual report for 1935-36 (fifth year) on Mr. Slater's scheme for the improvement of goats in the United Provinces.

10. Application from the University of Madras for a grant of Rs. 21,300 spread over five years for a scheme for enquiry into helminthiasis of cattle in the Madras Presidency.

11. Rice Research Scheme—Progress Reports :—

(*i*) Cancelled.

(*ii*) Cancelled.

(*iii*) Cancelled.

(*iv*) Bihar and Orissa, 1935-36.

(*v*) Cancelled.

(*vi*) Report of work done at Coimbatore in connection with the investigations on the quality of rice.

12. Renewal of rice research schemes :—

(*i*) Application from the Government of Bihar for a grant of Rs. 1,56,374 spread over five years for the extension of the rice research scheme in Bihar.

(*ii*) Application from the Government of Bengal for a grant of Rs. 1,41,333 spread over five years for the extension of the rice research scheme in Bengal.

(*iii*) Application from the Government of Orissa for a scheme of rice research in Orissa spread over a period of 5 years at a cost of Rs. 1,37,395.

13. Proceedings of the First Meeting of the Wheat Committee appointed by the Imperial Council of Agricultural Research.

14. Report of the Soil Science Committee :—

(*i*) Application from the Government of Bombay for a grant of Rs. 4,45,670 spread over five years for sub-surface investigation work carried out in the Lloyd Barrage area in Sind.

(*ii*) Cancelled.

(*iii*) Annual reports of the Physical Section of the Agricultural Experiment Station, Dacca, for 1934-35 and 1935-36.*

(*iv*) Cancelled.

(*v*) Cancelled.

(*vi*) Cancelled.

(*vii*) Cancelled.

*Report for 1935-36 cancelled.

15. New I. D. D. course for Provincial Agricultural and Veterinary Colleges—Report of the Special Committee.

16. Report of the tractor ploughing work conducted by the Burmah-Shell Co., during 1935.

17. Progress report for 1935-36 on Animal Nutrition Schemes :—

(*i*) Dacca.

(*ii*) Coimbatore.

18. (*i*) Consideration of the difficulties in securing material for plant breeding work in India.

(*ii*) Surveys of plant breeding material.

19. Cancelled.

20. Progress report on Agricultural Research Schemes (Botanical) :—

(*i*) Cancelled.

(*ii*) Annual report on the working of the Botanical sub-station, Karnal, for 1934-35.

(*iii*) Progress report for 1935-36 on the scheme of research on the cultivation of medicinal plants and the study of food poisons by Bt.-Col. R. N. Chopra.

(*iv*) Annual report for 1935-36 on the Hyderabad Castor Breeding Scheme.

21. Progress Reports on Agricultural Research Schemes—Meteorological and Statistical :—

(*i*) Annual report for 1935-36 on the scheme of statistical studies by Prof. P. C. Mahalanobis.

(*ii*) Annual report of the Agricultural Meteorological Branch for the year ended 21st August 1935.

22. Progress reports for the period December 1933—March 1935 and for 1935-36 on the Dry Farming scheme in Hyderabad-Deccan.

(*i*) Annual report of the Dry Farming Research Scheme (Rohtak), Punjab, for the year 1935-36.

23. Progress reports on fruit research schemes :—

(*i*) Cancelled.

(*ii*) Cancelled.

(*iii*) A. Cancelled.

B. Programme of work of the Horticultural Research Station at Krishnagar, Bengal, for 1936-37.

(*iv*) Final report of the scheme of research on the wither tip of citrus trees by Dr. H. Chaudhri.

(*v*) First progress report on the work done under the fruits and vegetables preservation scheme, Punjab.

24. Application from the Government of the Punjab for a grant of Rs. 29,820 spread over five years for a scheme for a survey and control of fruit diseases in the Punjab by Dr. H. Chaudhri, Punjab University.

25. Application from the Government of Madras for a grant of Rs. 92,487 spread over three years for a scheme of research for improving the fishing industry and developing the supply of fish manure.

26. Agricultural Marketing—Progress report, June 1936.

27. All-India Marketing Survey Reports.

28. Annual reports for 1935-36 on Provincial Marketing schemes :—

(*i*) Madras.

(*ii*) Bihar and Orissa.

(*iii*) Burma.

(*iv*) Sind.

(*v*) Annual report for 1935-36 on the working of the Economics and Marketing Section of the Central Provinces Department of Agriculture.

29. Need for additional funds and staff for the marketing schemes in the provinces :—

(*i*) Representation from the Government of Madras.

(*ii*) Representation from the Assam Government.

(*iii*) Representation from the Government of Bombay.

(*iv*) Representation from the Government of the Punjab.

(*v*) Representation from the Government of Bihar and Orissa.

30. Cattle improvement scheme initiated by His Excellency the Viceroy.

31. (*a*) Application for the extension of the Bombay Cold Storage Research Scheme for a period of three years with effect from 1st March 1937 at a total cost of Rs. 50,188.

31. (*b*) Application from the Government of Bombay for a grant of Rs. 11,019 spread over three years for research work on the development of gas storage of fruits and vegetables.

31. (*c*) Application from the Government of the Punjab for an extension of the scheme for research on the preservation of fruits and vegetables in the Punjab for two years with effect from November 1936 at a cost of Rs. 12,970.

32. Application from Brevt.-Colonel R. N. Chopra, School of Tropical Medicine, Calcutta, for an additional grant of Rs. 13,200 spread over three years to expedite work in connection with the study of medicinal plants and food poisons in India.

33. Application from the Government of Madras for a subsidy of Rs. 63,900 spread over three years to the Kerala Soap Institute, Calicut.

34. Proposal for the continuance of the Animal Husbandry Bureau as a *quasi*-permanent section of the Imperial Council of Agricultural research. (Cost involved Rs. 54,310 over 5 years.)

35. Notes on lines of future marketing developments.

PROCEEDINGS OF THE MEETING OF THE ADVISORY BOARD, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, HELD AT SIMLA ON THE 13TH JULY 1936.

The meeting commenced at 11 A.M. and the following were present :—

1. Sir BRYCE C. BURT, *Chairman.*
2. Mr. R. G. ALLAN.
3. Rao Bahadur ANANDA RAO.
4. Dr. B. K. BADAMI.
5. Rao Bahadur BHIMBHAI R. NAIK.
6. Mr. N. BRODIE,
7. Dr. W. BURNS.
8. Mr. F. CANNING.
9. Mr. P. H. CARPENTER.
10. Mr. N. CHATTERJEE.
11. Sardar DATAR SINGH.
12. Dr. J. K. DUBEY.
13. Mr. H. L. DUTT.
14. Mr. T. J. EGAN.
15. Mr. E. S. FARBROTHER.
16. Khan Bahadur FATEH-UD-DIN.
17. Mr. M. R. FOTIDAR.
18. Mr. J. S. GAREWAL.
19. Dr. J. C. GHOSH.
20. Mr. S. GHOSE.
21. Dr. L. K. HYDER
22. Raja JAGANNATH BAKSH SINGH.
23. Mr. W. J. JENKINS.
24. Mr. P. J. KERR.
25. Mr. A. M. LIVINGSTONE.
26. Mr. J. C. McDOUGALL.
27. Mr. K. McLEAN.
28. Sir CHUNILAL V. MEHTA.
29. Dr. S. K. MITRA.
30. Mr. MOHOMED HASSAN KHAN.
31. Sir MOHAMMAD YAKUB.
32. Dr. NARSIMHA IYENGAR.
33. Mr. NIZAMUDDIN HYDER.

34. Colonel G. NOEL.
35. Colonel A. OLVER.
36. Mr. K. P. PILLAI.
37. Mr. T. F. QUIRKE.
38. Diwan Bahadur T. RAGHVIAH.
39. Mr. P. B. RICHARDS.
40. Mr. P. T. SAUNDERS.
41. Mr. D. R. SETHI.
42. Mr. S. M. A. SHAH.
43. Dr. F. J. F. SHAW.
44. Mr. G. T. TAIT.
45. Rao Bahadur M. VAIDYANATHAN.
46. Rao Bahadur B. VISWANATH.
47. Mr. F. WARE.
48. Mr. V. L. WAZIR.

Mr. N. C. MEHTA, I.C.S., Secretary.

2. The Chairman before commencing the proceedings of the meeting said that he had a sad and pious duty to perform. He moved the following resolution of condolence on the death of the Hon'ble Khan Bahadur Mian Sir Fazl-i-Husain who for many years was the Chairman of the Imperial Council of Agricultural Research :—

"The Advisory Board of the Imperial Council of Agricultural Research desires to convey its respectful sympathy to the relatives of the late Khan Bahadur Mian Sir Fazl-i-Husain in their bereavement. The Hon'ble Sir Fazl-i-Husain was Chairman of the Imperial Council of Agricultural Research for over five years and the Council, like many other institutions in India for the uplift of the rural classes, owes much to his wise guidance. By his death it has lost a true friend."

The resolution was carried in silence, all members standing.

3. *Decisions of the Governing Body on the recommendations of the Advisory Board made in February 1936 [Subject No. 1 (a) of the agenda].* (Appendix I.)

Recorded.

The Chairman explained the distribution of the special grant made this year as a result of which, it had been possible to finance a number of schemes particularly the animal husbandry schemes. The net consequence was that the Council's waiting list was now a modest one. The Chairman also read the order passed by the Government of India in connection with the special grant. The Order runs as follows :—

That the Council shall :—

(1) undertake, as soon as possible, a scientific survey of the work in agricultural research, accomplished or in progress, or projected under its auspices, and obtain expert advice as to the

manner in which the production and handling of dairy products can be improved ;

(2) give approval in future only to such new research schemes as it can finance out of its available or promised resources, schemes which cannot be so financed being approved only with the prior concurrence of Government ;

* * * * * *

4. *Appointment of Committees [Subject No. 1 (b) of the agenda].* (Appendix II.)

The personnel of the sub-committees was approved with the following modifications :

1. *Botanical Sub-Committee.*

Dr. S. K. Mitra's name was added to the No. 1.

2. *Progress Reports Committee.*

The personnel of sub-committee was approved.

3. *Rice Research sub-committee.—*

The name of the Deputy Director of Agriculture, Orissa, as well as that of the Director of Agriculture, Kashmir, were added to the Sub-Committee.

4. *Marketing Sub-committee.*

Mr. G. T. Tait was added to the sub-committee.

5. *Fruits Sub-committee.*

The Director of Agriculture, Kashmir, was added.

Chaudhri Ramdhan Singh was substituted for Khan Bahadur Fateh-ud-din as the other would be engaged on another committee.

6. *Tractor Sub-committee.*

Mr. C. H. Parr was substituted for Mr. P. B. Richards.

7. *Dry Farming Schemes Co-ordination Committee.*

Mr. C. H. Parr was added.

8. *Soil Science Committee.*

Dr. J. K. Dubey was invited to attend the Committee.

Mr. Jenkins to take the place of R. B. Tamhane (absent).

The Agricultural Chemist, Madras, was invited to attend the Committee.

9. *Veterinary Progress Reports Committee.*

Items 4—15 was to read " Directors of Veterinary Services in the Provinces and constituent States ". The Assistant Director of Veterinary Services, Orissa, was added.

10. *Animal Nutrition Committee.*

The Agricultural Chemist, Madras, and

Mr. S. M. A. Shah were invited to attend as visitors.

Dr. Dalip Singh, Acting Agricultural Chemist, Punjab, was invited to serve in place of Mr. Lander on leave.

11. *Special sub-committee for I. D. D. courses.*

Rao Sahib D. V. Bal was invited to attend in place of Mr. J. C. McDougall.

Mr. P. J. Kerr to take the place of Mr. Carbery (absent).

Mr. C. H. Parr.

Sardar Datar Singh.

Mr. S. M. A. Shah, and the

Director of Agriculture, Travancore, were added.

Committee No. 12—Madras Fish Scheme Committee.

The names of the Director of Agriculture, Travancore, and the Director of Fisheries, Madras, were added to the Committee.

Committee No. 13. Standing Cattle Breeding Committee.

The following persons were invited to attend.

1. Mr. D. R. Sethi, Director of Agriculture, Bihar and Orissa.
2. Mr. V. N. Vazir, Superintendent, Veterinary Department, Kashmir.
3. The Dy. Director of Agriculture, Orissa.
4. The Director of Agriculture, Travancore.
5. Mr. J. C. McDougall, Director of Agriculture, C. P., in the place of Mr. J. V. Takle, Deputy Director of Agriculture (Livestock), Central Provinces.
6. Mr. B. K. Badami, Director, Veterinary Department, Hyderabad.

4. (*a*) *Appointment of Mr. B. K. Badami, Director, Veterinary Department, Hyderabad, on the Cattle Breeding Committee* (*Subject No. 2 Supplementary of the Agenda*). (Appendix II-A.)

This was approved.

5. *Reports of the three sub-committees appointed to consider the draft Briefs for Experts in connection with the scientific survey of the work in progress and contemplated under the auspices of the Imperial Council of Agricultural Research.* (*Subject No. 3 on the agenda.*) (Appendices III and III-A.)

The Chairman in introducing the subject first asked for the views of the Board on the draft terms of reference for the two Experts.

Dr. Hyder suggested that in line 1 of the first term of reference for the word 'advise' the word 'report' should be substituted. This was accepted.

The terms of reference as proposed by the sub-committee were approved by the Advisory Board.

Sir Chunilal V. Mehta moved the following addition :—

"To report how far the dissemination of scientific and technical information not only in regard to results of research but also with regard to agricultural and animal husbandry matters in general is being applied in ryots' practice and to advise what further steps are desirable for its more extensive and speedier application."

Rao Bahadur Bhimbhai Naik seconded the resolution.

Sir Chunilal V. Mehta said that he had experience of agricultural farms and agricultural institutions, but this aspect of the question was never gone into in great detail. He said that the Committee which was appointed by the Government of India to enquire into the working of the Forest Research Institute at Dehra Dun unanimously gave very considerable importance to this part of the work of the Institute. We had enough information which would be of the utmost use in the ryots' practice and what we were anxious to see was that the information was practically used. The Experts who were coming out from England might have succeeded in obtaining information on this particular question and it might be useful if they were asked to advise the Council on this point also.

The Chairman welcomed the suggestion of Sir Chunilal V. Mehta and suggested the following alteration :—

"To report how far the dissemination of scientific and technical information, not only in regard to results of research but also with regard to agricultural matters in general, can be improved in order that the results of scientific work may be applied in ryots' practice and to advise what further steps are desirable to this end."

This was accepted by Sir Chunilal V. Mehta and the amended text added as No. 7 in the terms of reference to the Experts.

The material which it is proposed to supply the Scientific Expert as set out in paragraph 3 of the report of the sub-committee (Annexure, Appendix III) was approved.

In regard to paragraph 4 of the sub-committee's report the Director of Agriculture, Kashmir, requested that he should be permitted to send in a special note dealing with the work done in Kashmir on Fruits and Insect Pests by the 15th of August 1936. This was approved. The Chairman said that it was intended to send the briefs to the two Experts in England so that they might be in a position to study them before they came out to India.

Review of work of Imperial Council of Agricultural Research—Agriculture—Crops and Soils Brief.

In the chapter on Field Technique Professor Mahalanobis said that the details of work given on page 4 on experiments on inter-action were designed under the Calcutta scheme and that those details should be suitably mentioned on page 5. With reference to the training of Agricultural Officers in Statistical Methods, Mr. Mahalanobis said that over fifty officers had been trained since the inspection of the scheme. The suggestions made by Prof. Mahalanobis were accepted by the Chairman who undertook to incorporate them in the brief. On the suggestion of Mr. Jenkins the Chairman undertook to have included in the brief a suitable summary on soil work done in Sind, if a copy of the published work on that subject could be had.

Chapter 12—Fruits—Page 1—Paragraph 3.

Col. Noel suggested that the reference to the work done by the North West Frontier Province, Department of Agriculture should be in the present tense and not in the past tense. He suggested that second sentence in that paragraph should read as follows :—

> "The orchards at this farm *are* models to fruit growers in the district and great success *has been achieved* with the introduction of exotic varieties and the distribution of young plants of good varieties."

The suggestion was accepted.

Chapter 12—Fruits—Page 10—Hyderabad, Scheme for fruit research. Mr. Nizammuddin Hyder pointed out that pine apple had been omitted from the programme of the scheme and that work on custard apple would be done at Hyderabad and that on grapes would be done at Aurangabad. This was accepted.

Chapter 16—Potatoes—Page 5—The Madras Scheme for research on potatoes in the Nilgiris, Item (1).

Mr. Ananda Rao suggested that the words 'long established' should be substituted for 'Desi'. The suggestion was accepted by the Chairman.

Mr. Richards suggested a reference to the work done in the United Provinces. This was accepted on the understanding that he would supply a brief note by the end of July. Subject to any additions, or corrections in matters of fact, on the lines suggested by the Committee, provided that these are received before 31st July 1936, the Brief was approved.

6. The Chairman welcomed Sir William Stampe, who had come to address the Advisory Board on the 'Utilisation of underground water-supply and application of hydro-electric power to agricultural problems'. He also welcomed the Members of the Irrigation Board to the meeting of the Advisory Board and hoped that they would come to the Advisory Board meetings whenever there were subjects of common interest under discussion.

Sir William Stampe then delivered the following address :—

Sir Bryce Burt and Gentlemen,

Developments under three heads.—I welcome this opportunity of informing you of some recent engineering developments in the United Provinces in so far as they affect the production of sugarcane and certain other valuable crops. These activities may be classed mainly under three heads :—

(*i*) The provision of additional irrigation facilities in areas which were hitherto dry on account of the shortage of river water for extending our canals.

(*ii*) The provision of cheap hydro-electric power for irrigation pumping and for processing the crops ; also for minor industrial purposes at some 1,800 village centres in the growing areas.

(*iii*) Experiments in improved transportation facilities for the extraction of the crops grown.

2. *Improved Irrigation.*—You are probably aware that in the United Provinces our future economic progress depends almost entirely on improved agriculture including irrigation. Nature has given us neither coal as a fuel nor other heavy minerals which make heavy industries practicable.

On the other hand, we have the three rivers in the west and central tracts of the Gangetic plains from which the major canal system of the Jumna, Ganges and Sarda are fed. Unfortunately the cold weather supply of these rivers together with that of the Ramganga, is inadequate to protect more than a fraction of the culturable areas in the commands of the rivers. Some solution of the problems of expanding irrigation was therefore necessary before we could advance further agriculturally, as our raifall, although adequate at certain times of the year, is uncertain and offers incomplete security for the protection of valuable crops. Two methods of extending irrigation presented themselves.

3. The first was the storage of surplus monsoon river water in Himalayan reservoirs. This is however impracticable at reasonable cost in most of our northern valleys owing to the instability of their hillside. It is doubtful whether such storage reservoirs would retain their capacity for more than 8 or 10 years.

4. *The tubewell scheme.*—It is in regard to the second method that I would particularly invite your attention this morning. Nature, however niggardly as regards the provision of minerals, has been generous in providing us with a liberal supply of underground water at an economic depth throughout the western and central Gangetic plain. The recent development of the Ganges Hydro-electric scheme, by providing current generated on the canal water falls, at some 1,800 transformer stations in the agricultural area of the west at a rate of 9 pies per unit has enabled this reservoir to be exploited for a widespread system of irrigation.

It has also been possible to reinforce our older canal systems by pumping water electrically from deep set rivers hitherto flowing to waste.

5. *1,500 State wells.*—The project under which some 1,500 State tube-wells are being constructed to command nearly two million acres in our seven western districts is briefly described in the note which has already been circulated to you. I need only recall the principal points, *viz.*, that each tube-well (yielding 1½ cusecs or 33,000 gallons per hour) can on a basis of 3,000 hours working in the year, give 4 to 5 waterings to 125 acres of sugarcane ; 1 watering to 60 acres of other *kharif* crops and 2¼ waterings, on the average, to 330 acres of wheat or other *rabi* crops. Thus, the system, as a whole, whilst protecting about 2,900 square miles of country, can irrigate roughly half a million acres of wheat, 180,000 acres of sugarcane and 90,000 acres of other *kharif*.

6. *Irrigation Rates.*—The rates at which this irrigation is being effected will interest those who represent the growers' associations. Water sold is measured in terms of the electric units used in pumping it. Each unit on the average lifts 4,000 gallons. Assuming each wheat watering requires 88,000 gallons per acre or 4 in. depth in the field, the cost at 1½ annas per

unit is Rs. 2-1-0 per watering or for 2¼ waterings Rs. 4-10-3 per acre as compared with Rs. 5 on the Ganges Canal. To give 110,000 gallons per watering to each acre of sugarcane, the cost is Rs. 3-14-0 per acre in the hot season when we charge Re. 0-2-3 per unit and Rs. 2-9-0 per acre for water given in the *rabi* season at the lower unit rate of Re. 0-1-6. Assuming 3 hot weather waterings and two of the cheaper *rabi* waterings the total cost of irrigation is Rs. 16-12-0 per acre as compared to Rs. 10 per acre on the Ganges Canal.

7. *The Volumetric system.*—In comparing tube-well and canal rates however, it must be remembered that the former are volumetric (or quantitative) rates whilst the latter are fixed crop-acre rates. On a tube-well the cultivator is thus financially interested in reducing wastage both in transit to and in his fields.

He can, moreover, take advantage of timely rainfall to reduce his cultivating costs by omitting one or possibly more tube-well waterings. In a dry year of course his total cost is still higher than on a canal system.

I would recall that the Agricultural Commission of 1927, whilst emphasizing the waste of water that takes place on many of our existing canal systems, strongly recommended the introduction of the volumetric principle in regard to the sale of water wherever possible.

It is of interest to note that on a tube-well, as a result of the more economic treatment of the water, one " cusec " (or unit of discharge) has been found to irrigate 4 to 5 acres per day as compared with 2 to 2½ acres per day on the average in the case of a " cusec " on a canal system.

I will not enter the field of comparison between canals and tube-wells as a means of irrigation. Each has its respective advantages and disadvantages which have been briefly outlined in the project report placed before you.

8. *Necessity of a power net-work.*—It must however be emphasised that a tube-well system of irrigation naturally presupposes the existence of a power net-work in the area to be developed. No widespread system of tube-wells individually energized by oil engines could in my opinion be made to pay its way at present grain prices.

9. *Stability of the sub-soil supply.*—Before leaving this subject I should mention a phase of the project which has been the source of much discussion and criticism. I refer to the question as to the capacity and stability of the underground reservoir. In a project involving the protection of some two million acres of culturable land, the degree of permanency of the source of supply is obviously a primary consideration.

In a scheme of surface river irrigation the scope of the project is based on the measured flow, averaged over a period of years. In dealing with underground water on the other hand we are literally working in the dark.

The problem may be summarised in the words of the terms of reference to the Committee of geological and hydraulic experts appointed by the Government in 1935 :—

(a) Whence is the water in the coarse-grained sand strata tapped by the projected tube-wells derived ? In what proportions is it attributable (i) to local rainfall and irrigation seepage in the tube-well tracts themselves, and (ii) to underground flow from the zones of higher rainfall in the "Tarai" lands below the hills ?

(b) To what extent is pumping at the proposed rate of 3,000 hours in the year from tube-wells yielding on the average 1 cusec per square mile of country commanded likely to lower local spring level ?

(c) To what extent is systematic pumping on the above scale likely to affect the supplies in the lower Ganges river at the Narora weir and in other rivers, by reducing the seepage flow from the high ground tapped by the tube-wells on both banks of the rivers upstream of the canal headworks to the south.

10. *Expert findings.*—The gist of the findings of the experts, Mr. Auden and Dr. Mackenzie Taylor, which have since been examined and corroborated by consulting engineers in London, may be briefly summarised as follows :—

(a) The alluvium in the Gangetic plain may be taken as not less than 2,000 feet deep over most of the tube-well area. This is approximately 8 times as deep as the tube-well borings. It consists, mainly, of water-laden sands with non-continuous lenticular beds of clays, and the whole area may, therefore, be considered as one large reservoir.

(b) The main source of replenishment is local rainfall which averages 30 inches yearly. But the rainfall of higher intensity in the submontane tract to the north (averaging 45 to 50 inches) as well as the percolation of water from the upper reaches of rivers issuing from the Sewaliks and inner Himalayas certainly helps to replenish the sub-soil supply by underground flow.

(c) A further but minor source is by seepage into the sub-soil from the canal-irrigated tracts on the western flank of the tube-well zones.

The view was expressed that, even assuming the most unfavourable conditions of rainfall, no percolation of irrigation water from the adjacent canal zones and complete isolation of the strata of the tube-well area itself from those of the surrounding alluvium which is almost certainly not the case—there would still be a balance of rainfall water in the year over the volume to be removed by tube-well pumping.

The experts expressed no definite opinion in regard to the effect of pumping on the Ganges flow at Narora as the rainfall and well-level data available in the districts on the east bank of the river were inadequate to serve as a basis for scientific conclusions.

11. Personally, in projecting the scheme, I have always presumed that a vast river flows, slowly but persistently, through the underground water-bearing sands from their outcrop in the Tarai near the hills towards the Bay of Bengal. This river, which is believed to move at a speed of only a few yards a day, depending on the local slope of the strata, is undoubtedly replenished in the various ways outlined by the experts. Dr. Mackenzie Taylor, a well-known physicist, held that no less than 80 per cent. of the underground water is derived from seepage from the local rainfall. However this may be, in those areas which have been fully developed up to date, provided pumping is limited to the scale laid down (*i.e.*, one cusec per square mile of commanded area), no sign of desiccation of the water-table has been observed.

12. *The financial position.*—On a capital outlay of approximately 114 lacs to be incurred on the 1,500 tube-wells with their distribution channels, roads and buildings, an approximate gross revenue of 38 lacs has been estimated. In forecasting the development of revenue it has been assumed that the wells will work for 1,000 hours during the first year, 2,000 hours during the second and 3,000 hours during ultimate years. Experience up to date indicates that these working hours are likely to be realised. The gross revenue on the basis of 3,000 hours running is Rs. 38¼ lacs yearly. On the expenditure side there is the item for depreciation on the mechanical plant Rs. 2.88 lacs, estimated on seventeen years' life of tube-wells and pumps. The annual cost of energy alone is 15½ lacs or 53 per cent. of the total annual charges amounting to 29 lacs. It is estimated that after deducting working expenses and borrowing charges a nett surplus will be realised rising gradually to 5 lacs in 1941-42.

13. Apart from the advantage it offers in regard to irrigation the enterprise has a wider significance in that by introducing electric power at a rate of 0|1|0 per unit at some 1,500 substations in the area of supply, it facilitates the economical processing of the crops grown and thus enables a larger proportion of the profits to be shared by the local agriculturist.

14. *The Hydro-electric Scheme.*—The second of our development activities comprises the provision of widespread hydro-electric power over the western districts. The Ganges Grid Scheme has been briefly described in the note already circulated to you and I need only say that out of a total installation of 29,000 Kilowatts, 10,970 have been allotted for State tube-well pumping, 2,650 for river and canal pumps, 2,600 for agricultural operations including private pumping, 10,500 for minor urban industrial purposes and 2,900 for domestic use, chiefly in the 88 towns energised by the Scheme. It is expected that the Grid Scheme will be complete within the ensuing financial year. The estimated capital cost including some 4,000 miles of transmission line and 2,000 Transformer Station is 343 lacs from which a small net return is expected after meeting the interest, depreciation and operating charges. The rates charged in the rural areas are 0|1|0 per unit (retail, low tension) for agricultural operations and 9 pies per unit for irrigation pumping.

For private pumping plants the rate is 0|1|0 per unit for the first 1,200 units in the year and 6 pies thereafter or an average of 9 pies in the case of installations working for 3,000 hours in the year. Some 200 private tube-wells have been installed and the number is increasing yearly. This rate for energy enables private tube-well owners to compete with State wells as a means of irrigation.

15. *Eastern extensions.*—The electrical amenities described above apply only to the districts as far east as Budaun. A further eastward extension of the Ganges Grid is not feasible owing to the excessive length of the transmission lines which have already reached the economic limit for the voltage employed. A higher voltage would not be economical during the development stage as the cost of " stepping down " to the local village voltages would be disproportionate to the value of the loads thereby connected. Nor is surplus power from the eight available Ganges canal falls likely to be forthcoming when the area already covered has been fully developed electrically. It follows that any further eastern extensions must be energised either by hydro stations installed in the Himalayas (or on the Sarda Canal) or by steam stations located within the extended area of supply. The first alternative may be ruled out on economic grounds for many years owing to the great distances from which power would have to be transmitted from suitable sites within the mountains. The location of such stations on the unstable rivers of the outer Himayalas would also militate against success. This question must be reconsidered if and when great loads have been developed in the Provinces and the higher load factor thereby attained will have justified the investment of capital on hydro stations as an alternative to the annual cost of coal consumed within the area. The Sarda Canal has been prospected for power development but its lay-out is unsuitable owing to the small height of the falls. Regarding of the canal on a large scale would not be feasible owing to the dangers of water-logging in the submontane reaches.

16. *Cost of steam electric power.*—On the other hand, a careful analysis of steam generating costs has been made in connexion with the recently projected Chandausi and Fyzabad power stations. Power from modern steam turbines can be made available at a basic rate of about 4 pies per unit at stations suitably located in regard to the loads obtaining in particular areas. It is true that hydro power can be produced with the same load factor at suitable sites at approximately half this cost. But the incidence of cost per unit involved in transmitting this power from distant sites to the area of utilization more than doubles the cost at the site required. In other words, the higher cost of steam power generation *within* the area of supply is counterbalanced by the elimination of the heavy transmission costs incurred in bringing cheaper power from a great distance. This important economic argument can be made plainer by an illustration. The approximate generating cost on a 38 per cent. load factor on the Ganges Grid is 3 pies per unit at the power stations, whereas the cost of high tension distribution is of the order of 5 pies making a total of 8 pies, the average bulk supply cost per unit at the 2 000 transformer stations now under completion. In the case of an eastern steam power net-work these figures would be reversed as it would be possible to

locate the generating stations in relation to the loads to be energized so that the transmission costs could be reduced to an average of 3 pies per unit on the local net-work with a resulting cost of about 7 pies at the substations. Naturally, as we advance eastwards towards the Bihar coal fields, the local price of steam coal is correspondingly reduced thus loading the scales still further in favour of local generation. The possibilities of pumping water from the Lower Ganges and Jumna rivers in our arid eastern districts for the purpose of irrigation are now being explored. A combined steam electric power net-work and irrigation pumping scheme from the Ghogra river is under construction.

Such a project, if successful, would, apart from its intrinsic local importance, demonstrate the feasibility of similarly electrifying other districts where a supply of river water exists and where suitable geological conditions can be obtained for State wells in areas remote from the rivers. The importance of these developments on the future welfare of the province cannot be overestimated. The intervention of cheap power through the development of the resources of modern engineering, offers new hope not only for the minor urban industrialist but also for millions of cultivators who are at present living perilously close to starvation due to lack of facilities for growing adequate crops.

17. *Transportation.*—The possibility of bringing cheap electricity to the zamindar's aid, for driving small sugar plants has been carefully studied in the grid area and an experimental sugar factory driven partly by steam and partly by electricity was undertaken to explore the difficulties inherent in such plants. The recent rise in the price of cane, the drop in the price of sugar and the excise duty have, however, militated against the economic use of such factories and it seems doubtful whether zamindars will be able to operate them successfully unless they grow their own crops. A full report on the working of the experimental factory will shortly be published.

18. The question of the carriage of sugarcane to factories from remote areas has also recently been studied. An experimental steam-driven tramway 30 miles long installed in the Meerut district promises to assist the distant growers of cane. This enterprise which is still in its infancy promises to pay its way taking into account interest charges, depreciation and working expenses. Cane can be carried at an inclusive rate of half a pie per maund per mile which compares favourably with the rate of one pie per maund for bullock-cart traffic already obtaining in the area. The working of this experimental tramway will be carefully studied before further extensions are undertaken.

19. Another development in transportation facilities is the provision of additional bridges over deep *nalas* and streams in the sugar cane growing areas ; two bridges of a cheap type have already been constructed and four others are now being undertaken in the Muzaffarnagar district.

20. *Improved agriculture and manuring.*—Demonstrations of improved agricultural methods including the sale of chemical fertilizers have been organized jointly by the Irrigation and Agriculture Departments

staff. It was realized early in the tube-well development that, unless such steps were taken, there would be a danger of exhausting the fertility of the soil owing to the intensity of sugarcane cultivation in the close vicinity of tube-wells. A system of liquid fertilization is being explored by which the cultivator can impregnate his water with a suitable fertilizer in solution to the degree necessary for the local soil.

21. *Social amenities.*—The tube-well may also become a focal point for village improvement. Drinking and bathing facilities for both men and cattle are being provided at the wells. Loud speakers can be installed with advantage at wells adjacent to villages where news about prices, rates, fertilizers and other matters of agricultural interest can be broadcasted to the cultivators.

The resources of engineering are thus being brought to the relief of the cultivators of the western districts with a view not only to increasing their share of agricultural profits, but also to improving their social life.

After Sir William had delivered his address, the Chairman in thanking him said that the question of electrifying agriculture had been mentioned at the Council's meetings more than once. It was essential that there should be some control over intensive development of work of this kind as otherwise there was a great risk of cultivators surface wells being depleted in unfavourable years. He invited members of the Advisory Board and of the Irrigation Board to put questions that they might like to put to and Sir William would reply.

Colonel Noel said that in the North-West Frontier Province they had great difficulty in regard to water table which was in some cases as low as 93 feet. Sir William said that the depth of water varied from 45 to 15 feet. Twenty feet water table was the average. Electricity charges varied inversely according to depth. The rate of charges quoted by him was an inclusive one—including the overhead charges and depreciation. The object of the scheme was to make the cost of providing a thousand gallons of water at the same rate over the whole area. It would not be economic to pump up water from below about 45 feet. for the irrigation of ordinary cereals at the present grain prices. It might however be possible in the case of sugarcane to pump from 60 feet.

Further explaining the scheme, Sir William said that the capital cost of one and a half cusec tube-well and channels including lining of channel for 1 mile long comes to about Rs. 8,000. It was in any case over Rs. 5,000 per cusec and under Rs. 6,000 per cusec.

The draw-down in the sandy area when a pumping of 33 thousand gallons an hour was on the average 17 feet but varied from 15 feet to 22 feet, depending upon the porous character of the soil. In fibrious sands the draw-down was as much as 22 feet and in some cases 25 feet. The working cost per cusec day came to about twice as much as 60 to 80 per cent. more than the cost per cusec day on the canal system. The yield of tube-wells per cusec was also twice as much as on the canal system.

One cusec run on a tube-well would irrigate on average $4\frac{1}{2}$ acres in a day. A tube-well would also earn twice as much money (gross) at the same rate in a day, as a canal cusec. Wells worked with oil engines were not economic. Though the net expenditure on a electrified tube-well was necessarily greater than on the canals on account of the expenditure for power for pumping the water, it was possible to economise water by the volumetric system, as it was found that with charges levied at present a given quantity of water went much further in irrigating the crops than under the usual conditions of canal irrigation.

Replying to an enquiry from Mr. Jenkins about the type of strainers, he said that there were two types of strainers. The first type known as solid brass Tej strainer which was made in Lahore was very durable and stronger than the other patterns but more expensive. The second type known as Agricultural type was economical and cheaper but the trouble about this was that if an attempt was made to draw it out of the ground, the cloth portion of it would crumble and a large portion at any rate of the fine copper meshes was left in the ground.

Sir William Stampe said that the average life of a tube-well was calculated as 17 years and on this basis the depreciation was calculated. In view of the experience that there were many tube-wells of over 12 years of age which were working with undiminished water-supply, he thought that an estimate of 17 years life was a conservative one. The Chairman then thanked Sir William Stampe on behalf of the Board for his very interesting address and said that it was over twenty years ago that Agricultural Engineers had started installing up tube-wells and now a stage had been reached when even a canal of substantial size could be filled by water from tube-wells. This was one of the great economic advances in agriculture which had been made in Northern India in recent years.

N. C. MEHTA,
Secretary.

SIMLA,
The 13th July 1936.

PROCEEDINGS OF THE MEETING OF THE ADVISORY BOARD OF THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH HELD ON THE 16TH JULY 1936.

The following were present :—

1. Sir BRYCE C. BURT, *Chairman.*
2. Mr. R. G. ALLAN.
3. Rao Bahadur ANANDA RAO.
4. Dr. B. K. BADAMI.
5. Rao Bahadur BHIMBHAI R. NAIK.
6. Mr. N. BRODIE.
7. Dr. W. BURNS.
8. Mr. F. CANNING.
9. Mr. P. H. CARPENTER.
10. Mr. N. CHATTERJEE.
11. Sardar DATAR SINGH.
12. Dr. J. K. DUBEY.
13. Mr. H. L. DUTT.
14. Mr. T. J. EGAN.
15. Mr. E. S. FARBROTHER.
16. Khan Bahadur FATEH-UD-DIN.
17. Mr. M. R. FOTIDAR.
18. Mr. J. S. GAREWAL.
19. Dr. J. C. GHOSH.
20. Mr. S. GHOSE.
21. Dr. L. K. HYDER.
22. Raja JAGANNATH BAKSH SINGH.
23. Mr. W. J. JENKINS.
24. Mr. P. J. KERR.
25. Mr. A. M. LIVINGSTONE.
26. Mr. J. C. McDOUGALL.
27. Mr. K. McLEAN.
28. Sir CHUNILAL V. MEHTA.
29. Dr. S. K. Mitra.
30. Mr. MOHOMED HASSAN KHAN.
31. Sir MOHAMMAD YAKUB.
32. Dr. NARSIMHA IYANGAR.
33. Mr. NIZAMUDDIN HYDER.
34. Colonel G. NOEL.

35. Colonel A. OLVER.
36. Mr. K. P. PILLAI.
37. Mr. T. F. QUIRKE.
38. Diwan Bahadur T. RAGHVIAH.
39. Mr. P. B. RICHARDS.
40. Mr. P. T. SAUNDERS.
41. Mr. D. R. SETHI.
42. Mr. S. M. A. SHAH
43. Dr. F. J. F. SHAW.
44. Mr. G. T. TAIT.
45. Rao Bahadur M. VAIDYANATHAN.
46. Rao Bahadur B. VISWANATH.
47. Mr. F. WARE.
48. Mr. V. L. WAZIR.

Mr. N. C. MEHTA, I.C.S., *Secretary.*

2. The Advisory Board met at 10-30 A.M. in the Library of the Council of Sate Buildings when it had the honour of being addressed by His Excellency the Viceroy who was accompanied by the Hon'ble Sir Jagdish Prasad. In welcoming His Excellency to the Advisory Board, the Chairman, Sir Bryce Burt, said :—

"It is a great privilege to welcome Your Excellency to this the fourteenth meeting of the Advisory Board of the Imperial Council of Agricultural Research. The Council owes its existence to the recommendation of the Royal Commission on Agriculture over which Your Excellency presided and it is from the Report of that Commission that we have drawn the inspiration for much of our work. If I may be permitted to say so, we do not feel that Your Excellency is in any sense a stranger to us. Many of us had the privilege of meeting you during your tour in India in 1926-1928 and, at an even earlier date, Your Excellency's name was familiar to many of us as Chairman of the Departmental Committee on Distribution and Prices of Agricultural Produce and as Chairman of the Edinburgh and East of Scotland College of Agriculture. Your Excellency's deep and abiding interest in all that pertains to agricultural improvement and rural uplift has already been of the greatest encouragement to us.

It would be inappropriate for me to attempt any review of the work of the Imperial Council of Agricultural Research as that task is shortly to be undertaken by two scientists of eminence. But we may fairly claim that we have achieved some measure of success in the performance of the duties laid upon us, *viz.*, the encouragement, development and co-ordination of research in agriculture and animal husbandry

and the dissemination of scientific and technical information. By formal Resolution and other pronouncements Provincial Governments have clearly shown their appreciation of the fact that, during a period of financial stringency the Council's grants have enabled stagnation to be avoided and some progress to be maintained in agricultural and veterinary research. The support which we have received from scientific workers in India is perhaps the best indication that our efforts to secure co-operation and co-ordination have been welcomed.

In one sense this meeting of the Advisory Board marks a new stage in our work in that we are now able to review the progress made on a number of research schemes and consider the extent to which they should be continued and how our successes can be developed. This task has been materially lightened by the assistance which we receive from a number of technical committees on which agricultural and veterinary research officers and scientists from the various Universities have given us their whole-hearted assistance. It is specially appropriate that this stage should coincide with Your Excellency's arrival in India. It is now my privilege to ask Your Excellency to address the Board."

3. His Excellency the Viceroy delivered the following address :—

GENTLEMEN,

It gives me great satisfaction that within 12 weeks of my assuming charge of office as Viceroy I am afforded this opportunity to address the Advisory Board of the Imperial Council of Agricultural Research, and to welcome to the headquarters of my Government representatives of the Agricultural and Veterinary Services from every Province in India, and from representative Indian States, to whose number I am glad to welcome the addition of Kashmir.

The establishment of the Council marked the acceptance by the Government of India of the most important of the recommendations of the Royal Commission in the field of Research. I think it is generally agreed that the experience of the last seven years has demonstrated the suitability of the scheme for the purposes for which it was devised. Those purposes, in the words of the Commission's Report, are to promote, guide and co-ordinate agricultural research throughout India, and to link it with agricultural research in other parts of the British Empire and in foreign countries. In advancing this recommendation, my colleagues and I were moved by the hope that the setting up of the Imperial Council would strengthen and extend the spirit of co-operation and mutual help between the Centre and the Provinces in the great work of agricultural improvement. Our investigations had impressed us with the very important part which central organisations play in the field of agricultural research and of rural development in countries such as the United States of America, Canada and Australia. We were convinced that we could render no greater service to the cause of agricultural progress in India than by seeking to discover means to counter the growing decline in co-ordination between Centre and Provinces and between

Province and Province, which had become increasingly evident to all observers in this country, and which had its origin in the constitutional changes that had taken place. We were mindful, too, of the further constitutional developments which were then under consideration, and which have since taken statutory shape in the Act of 1935, and deliberately we set ourselves to frame a plan in harmony with those changes that are now imminent.

I have watched with close and sympathetic interest the work of the Imperial Council since its inception, and I can say with truth that that work and its consequences throughout India have fulfilled the hopes of those of us who were responsible for recommending its constitution. Let me add, however,—and here I am sure that I speak for all my colleagues of the Royal Commission—that the best of plans must depend for their success upon the skill and devotion of those that execute them, and let me take this opportunity to pay a tribute to the manner in which all concerned with the work of the Council have contributed to the success of this common endeavour.

I have done what I could since I returned to India to make myself familiar with some of the current activities of the Council. I cannot, in the time at my disposal, touch upon more than a few of these, but I think you will recognise that there is no branch of your work in which I do not find myself deeply interested, and most anxious to extend to you such support as may lie in my power to afford.

In contemplating the functions of the Council, I have always felt that one most useful service which it would be in a position to perform, would be the dissemination of scientific and technical information. I have made some enquiries upon the point and I understand that the scheme considered by you in 1930 for an Agricultural Information and Intelligence Bureau had to be laid aside on account of financial stringency. I have been at pains to acquaint myself with the facilities at present provided for dissemination of information, and I recognise that these are by no means inconsiderable. It is for you to judge, as the means become available, to which projects priority ought to be given, but I am unable to resist the conclusion that this is a matter to which you may well think that further attention may usefully be given in the not distant future.

I gather that your efforts have hitherto been to a large extent concentrated upon a limited number of important crops such as wheat, rice, sugar and fruit. Cotton has of course received continuous attention from the special Committee concerned, while jute will shortly be placed in a like position. I was glad recently to have an opportunity of visiting the temporary Hill Laboratory in Simla, and to examine there the work in progress on Cereal Rusts and on potato-breeding. I am particularly glad to learn that you have now turned your activities towards research in "dry-farming" and to know that research work is being directed towards the improvement of that very important group of food grains, the millets. I venture the opinion that this work will prove to be of great value. I attach importance to it not only because of the large area still under these crops, but because of the advantage that will accrue from any material improvement of the millets and from a better system of "dry-farming", to many of the poorest cultivated districts in India.

I was privileged, a little while ago, to open the First Session of the Advisory Committee on Human Nutrition, upon which Committee there were two representatives of the Imperial Council of Agricultural Research. I suggested upon that occasion, that a trained research worker in human nutrition might be accommodated in the new Imperial Agricultural Research Institute at Delhi, and I am encouraged to think that this step may prove feasible. I feel sure that there are many opportunities for co-operation between these two branches of scientific research. Let me give only one instance. The area under heavy-yielding varieties of staple crops now amounts to some 20 million acres, and is steadily expanding. These are the crops as to which, of recent years, there has been over-production throughout the world. Have we not reached in this regard a point when we may expect this expanding area under high-yielding varieties of those staple crops to release a considerable amount of land for the growing of leguminous crops, so that both men and animals may find available a better balanced diet ?

The extent to which the welfare of the rural population is indissolubly linked with an improvement in the breeding and feeding of cattle and buffaloes is patent, and I am indeed happy to no e that the number of animal husbandry schemes receiving grants is now steadily increasing. I understand that the earliest of these schemes, the maintenance of a Disease Investigation Officer in each Province to form a link with the Central Veterinary Research Institute at Muktesar, has proved an unqualified success and has led to a degree of precision in the knowledge of animal diseases which was previously lacking, as well as to a fuller exploitation in the countryside of the results of the research work carried on in Muktesar, a striking example of this being the very successful goat vaccine method of protecting cattle against Rinderpest.

I look to you with all confidence to support me and the Governors of Provinces in our efforts to make available to cultivators an adequate supply of good stud bulls. I have been greatly encouraged by the response of the public to my appeal for the gift of such animals, and I note with the utmost satisfaction that the movement continues to gain impetus. In an endeavour of this nature, two things are of cardinal importance : continuity of effort, and the proper recording of results. The registration of pedigree stock and of the progeny of good sires is a most important step in the improvement of any breed, while in the case of milch breeds, the recording of performance in terms of milk yield is the essential basis of selection for breeding. I am glad to know that the standing Cattle Breeding Committee of this Council is to meet tomorrow and that these important matters will find a place upon its agenda. This Committee will also, I understand, take under review the detailed preparation of a study of the milk supply in villages. It is only upon exact information of this kind that it will be possible to formulate a sound breeding policy designed to secure a better milk supply for the general population, an object worthy of our utmost endeavours.

I am glad to note that the improvement of marketing is receiving your attention, and I look forward with interest to a study of the results of the several marketing surveys now being carried out. The collection

of information of this character over a region so extensive must necessarily take time, but in my experience—which in this field is considerable—it will prove in the outcome to be time well spent.

It gives me very great pleasure to be able to announce today that, thanks to the friendly co-operation of the governing bodies of the Rothamsted Experimental Station and the Hannah Dairy Research Institute of Ayrshire, arrangements have been made for Sir John Russell, F. R. S., Director of the Rothamsted Station, and Dr. N. C. Wright, the well-known Dairying Expert, to visit India and to give us the benefit of their expert advice. These gentlemen are outstanding figures in their respective fields, and it is beyond question that their collaboration may be relied upon to produce results of great and lasting value.

Surveying the whole field of agricultural improvement as this presents itself to me after an absence from the country of nine years, I think it is true to say that at no time has the position of agricultural research presented a more healthy or promising appearance. In the field of demonstration and propaganda I think the time has come when all concerned should ask themselves whether the machinery whereby the fruits of research are made available to the cultivator is adequate to the great opportunities for advance which now present themselves. In this connection, I cannot but feel that the establishment of a greater degree of co-ordination than would appear at present to exist between District Officers and the officers of other Departments of Government—Public Works, Irrigation, Agricultural, Veterinary and Co-operation—would strengthen materially the means at disposal for promoting agricultural improvement as well as rural betterment in the widest sense.

There can be no doubt but that public interest in agricultural improvement is everywhere increasing, and I am informed by experienced officers that the readiness to receive expert advice now-a-days displayed by cultivators is in marked contrast to the indifference shown but a few years ago in many areas towards the ministrations of the agricultural officer. The road is clear for a great advance in India's premier industry. Let us seize with all eagerness the opportunity thus presented. Over the whole range of agricultural improvement let the word be "Full speed ahead"!

4. After His Excellency the Viceroy and the Hon'ble Kunwar Sir Jagdish Prasad had left at 11 A.M. the Board resumed its agenda. Discussion of subject No. 3 (Appendix III) was resumed. In view of the fact that several members of Committees who were not members of the Advisory Board were also present, the Chairman announced that the Advisory Board's proceedings were purely departmental and should be treated as confidential.

5. The Report of the Sub-Committee appointed to consider the draft brief for the Expert in Dairy Science (subject No. 3) (Appendix III-A) was taken into consideration.

The draft terms of reference, as amended by the Dairy Science and Cattle Improvement Sub-Committee (Annexure I, Appendix III-A), were considered by the Board and approved unanimously.

With reference to items 5 and 6 of the Terms of Reference, the Chairman, in reply to an enquiry from Dr. Hyder, said that the list of schemes referred to dairy science and animal husbandry matters generally. Dr. Wright's review would be concerned with dairying schemes and connected schemes. The Chairman read out a draft item to be added as No. 7 to the Terms of Reference on the request of Sir C. V. Mehta who had left Simla. The draft ran as follows :—

"To report how far dissemination of scientific and technical information, not only in regard to research but also in regard to animal husbandry matters in general, is being applied in practice and to advise what further steps are desirable for more extensive and speedier application."

Dr. Hyder moved that this addition be made. This was seconded by Rao Bahadur Bhimbhai Naik. The addition was accepted unanimously.

Diwan Bahadur Raghaviah moved an addition to the above-mentioned para., *viz.*, After "Animal Husbandry matters in general" to add the words "with special reference to dairy science".

The detailed amendments proposed by the Sub-Committee as given in Annexure III of Appendix III-A were discussed one by one and adopted unanimously.

List of Animal Husbandry Schemes in progress—item No. 1, line 1. For "Imperial Bureau of Mycology" "Imperial Agricultural Bureaux" was substituted. The Chairman reminded members that there were 8 of these, 4 of which dealt with Animal Husbandry subjects.

List of schemes sanctioned by the Governing Body and awaiting allotment of funds—Item 5, was deleted. With these minor amendments the Advisory Board accepted the recommendations of the Committee.

In the printed brief entitled "Draft appreciation prepared by the Imperial Council of Agricultural Research" (not printed) paragraphs 1—7 were approved as amended by the Sub-Committee (Annexure II of Appendix III-A). It was agreed that in the table in paragraph 8, page 4, all quantities should be in ounces. It was pointed out by Rao Bahadur Ananda Rao that the quantity of consumption of liquid milk per head per day in Madras should be in terms of ounces and not measures. Mr. Littlewood promised to send in the revised figure.

Paragraphs 9—12 were approved as amended by the Sub-Committee.

Paragraph 13.—The Chairman suggested that in line 2 on page 7 the word 'certain' should be substituted for 'various'. The Board approved this amendment as well as the amendment suggested by the sub-committee.

The Chairman drew the attention of the Board to the various items relating to the difficulties experienced in making rural milk supply available in towns mentioned in paragraph 14 of the brief. The members had no remarks to offer and they approved the points mentioned therein and also the amendment suggested by the sub-committee.

The amendments suggested by the sub-committee to paragraphs 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, 30 and 31 were approved.

There were no amendments to paragraphs 28 and 32 and the Board approved them as they were.

Paragraph 33.—Dr. Burns referred to the opening sentences in this paragraph and said that about two million acres fodder cut green was attributed to the Bombay Presidency. This was not correct. The Chairman said that the difficulty which we were up against was that there was a lease of uniformity in the recording of fodder crops in the Season and Crop Reports in the various provinces. What was necessary was to take into account all the crops in India which were used for fodder. Col. Olver said that no reliable information was available on the subject. He was of the opinion that the Directors of Agriculture in the provinces should be requested to supply figures relating to the area under special fodder crops and other cereals, the straw of which could be used as fodder.

Dr. Burns said that the Season and Crop Report for the Bombay Presidency showed separately *jowar* grown for fodder only and also *jowar* grown for both grain and fodder. Figures for *jowar* cut green were also obtainable. He said that he could give accurate information as regards the area under fodder crops. Khan Bahadur Fateh-ud-Din said that the Punjab system was similar to that in the Bombay Presidency. Mr. Sethi said that fodder crops in Behar were lumped with Ghadai crops. *Jowar* was only grown for fodder. He said that he could give the area figures for *jowar*. In Bengal the practice was the same as in Bihar. Mr. C. H. Parr said that lucerne and berseem were grown in the United Provinces as fodder crops. *Jowar* was classified as a grain crops and classified as *Chari* when grown for fodder. Rao Bahadur Ananda Rao said that he could give figures for the area under fodder crops in Madras.

The Chairman in conclusion said that figures were clearly available in temporarily settled provinces whereas in the case of permanently settled Provinces they were not available. He requested the Directors of Agriculture to supply information as early as possible on the following three points :—

(1) The areas under cereal crops, the straw of which was used for fodder.

(2) The area of special fodder crops.

(3) Any detailed information about special fodder crops including the area reserved for green fodder.

The Directors of Agriculture agreed to supply the information. The Chairman said that paragraph 33 of the brief would be redrafted in the light of the information that would be received from the provinces.

Paragraph 34.—The paragraph was accepted.

Paragraph 35.—The Chairman said that this paragraph would have to be redrafted in the light of replies received in connection with paragraph 33 above.

Paragraph 36.—Khan Bahadur Fateh-ud-Din said that in the last paragraph the profits on an acre of land producing fodder has been shown as Rs. 150. He thought the figure was incorrect and the whole of this paragraph gave a misleading idea and should either be deleted or re-written from an economic point of view.

The Chairman did not agree with Khan Bahadur Fateh-ud-Din's proposal to delete the paragraph entirely. Khan Bahadur Fatehuddin asked whether there was any military dairy farm or private farm which could give actual figure of net profits as Rs. 150 per acre from dairying.

The Chairman said that this was the return which a farmer could hope to get if he followed proper methods of dairying.

Khan Bahadur Fateh-ud-Din said that the outturn of 450 maunds of fodder per acre was excessive. He thought 300 maunds would be a more correct figure. The Chairman said that personally he would accept the figure of 300 maunds and added that it would be seen from statement VIII that the average production of fodder on Government farms from irrigated land was about 450 maunds but such returns could not be reached by the ordinary ryot.

Col. Olver said that those were the actual figures obtained from Military dairy farms in different parts of India.

The Chairman pointed out that the Sub-Committee proposed to amend the first portion of the paragraph by the addition of the following words after 450 maunds " but such returns cannot be reached by the ordinary ryots ". The amendment was approved. Instead of " different parts of India " it was agreed that " on Government farms " be substituted.

Mr. McDougall said that the addition of some qualification was needed to show that the greater yield was not due solely to better feeding on the Military dairy farms. The Chairman pointed out that the records of the Military Department were very reliable.

Sardar Datar Singh said that the question was threshed out at some length in the sub-committee and the conclusion reached was that there were certain data of the Military dairy farms which could not be rebutted should therefore be included in the report. Mr. Allen said that his experience was the same as Mr. McDougall's.

The Chairman said that a foot-note should be added that " When village cattle are brought on to a Government farm, the milk yield often drops in the first lactation ".

This was accepted.

Mr. D. R. Sethi suggested that the profits of milk yield should not be calculated on 0-1-0 per lb. in the villages as it was impossible to get such a price, but on the outturn of ghee. The Chairman said that this illustration referred to liquid milk production only.

Khan Bahadur Fateh-ud-Din enquired whether the cost of the dry period of the cow was also included in the calculation of the profits.

Col. Olver said that the profit was calculated on the lactation period of 300 days.

Dr. Burns said that the whole paragraph should be omitted as the economics of dairy production varied from place to place.

The Chairman said that he felt it to be important that we should try and arrive at something definite. This was an important issue.

Dr. Burns said that in that case very much broader data were required.

Dr. Hyder said that there were no available data to answer the question regarding the extent to which substitution of fodder crops would affect the income of the cultivator. For answering such a question a wider enquiry and more satisfactory data were required than what were available at present. He added that the Expert to the Council was not the proper person to answer a question of this character. Mr. Carpenter agreed with the view of Dr. Hyder.

The Chairman suggested the addition of "To take a single illustration" before sub-paragraph 2.

Mr. Bruen was in favour of deleting the paragraph.

Mr. Bruen said that his impression was that 0-0-6 per lb. of milk as selling price in villages was accepted by the sub-committee.

The sugges ion to add "To take a single illustration" was carried.

Mr. Bruen said that the sub-committee had recommended the deletion of the entire paragraph.

Col. Olver accepted Mr. Bruen's statement but thought that if the figures were re-calculated they would be useful to the Expert.

Mr. Ware supported Mr. Bruen and added that the feeling of the Board was hat this kind of theorising should not be included in the report of the sub-committee, as such a report should contain nothing but s atement of established facts. He, therefore, proposed that the paragraph be omitted.

S. Kartar Singh said that the figures given in the paragraph were wrong and required re-calculation. The Chairman asked S. Kartar Singh to send in his amendments in detail. S. Kartar Singh then said that he would give the figures then and stated that in the last paragraph, page 17, an acre of fodder is fed to two cows which have been bought for Rs. 150. One acre can hardly maintain two cows for 400 days which is the average interval between two calvings. This comes to 225 maunds of fodder per cow, which meant $(225 \times 82) \div 400 =$ 46 lbs. of fodder per day = 4.6 lbs. starch. A cow required for maintenance .5 lb. protein and 5 lbs. starch. Thus the cow could hardly maintain herself and could not produce milk, as there was nothing left in the food for the production of milk.

The suggestion to omit the paragraph 3 was accepted.

Paragraph 37.—Approved.

Paragraph 38.—Had already been accepted.

V.—*Breeds and Breeding.*

Paragraph 39.—Dr. Shaw enquired whether the later figures in regard to average daily yield of milk in cows of the Pusa herd could be incorporated in this paragraph instead of the old figures already given. The suggestion was accepted.

Rao Bahadur Viswanath drew attention to the remarks in sub-paragraph of paragraph 39, *viz.* " The system is of such a highly specialized type necessitating a large and specially trained staff to carry out the special handling and very frequent milking which are a part of the system that it is necessary to reserve judgment as to whether it would be feasible for the ordinary dairy farmer to adopt " and suggested that these comments should be deleted and the whole paragraph should be recast.

The Chairman suggested the addition of the words " as the method was still in the experimental stage " after the words ' farmer to adopt ' in line 10 of this sub-paragraph.

This was accepted.

The Advisory Board adjourned at 12-45 P.M. for lunch.

N. C. MEHTA,
Secretary.

SIMLA ;
The 16th July, 1936.

PROCEEDINGS OF THE MEETING OF THE ADVISORY BOARD OF THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH HELD ON FRIDAY, THE 17TH JULY 1936.

The following were present :—

1. Sir BRYCE C. BURT, *Chairman.*
2. Rao Bahadur D. ANANDA RAO.
3. Dr. B. K. BADAMI.
4. Mr. N. BRODIE.
5. Mr. E. J. BRUEN.
6. Dr. W. BURNS.
7. Mr. F. CANNING.
8. Dr. J. K. DUBEY.
9. Mr. H. L. DUTT.
10. Mr. T. J. EGAN.
11. Mr. E. S. FARBROTHER.
12. Khan Bahadur FATEH-UD-DIN.
13. Mr. M. R. FOTIDAR.
14. Mr. J. S. GAREWAL.
15. Dr. J. C. GHOSH.
16. Mr. S. GHOSE.
17. Dr. B. N. IYENGAR.
18. Mr. W. J. JENKINS.
19. Mr. P. J. KERR.
20. Mr. J. C. McDOUGALL.
21. Mr. K. McLEAN.
22. Dr. S. K. MITRA.
23. Dr. NAZIR AHMAD.
24. Mr. NIZAMUDDIN HYDER.
25. Colonel E. W. NOEL.
26. Colonel A. OLVER.
27. Mr. K. P. PILLAI.
28. Prof. P. K. PARIJA.
29. Mr. T. F. QUIRKE.
30. Major P. B. RILEY.
31. Mr. P. T. SAUNDERS.
32. Mr. D. R. SETHI.
33. Mr. S. M. A. SHAH.
34. Dr. F. J. F. SHAW.

35. Rao Bahadur M. Vaidyanathan.
36. Mr. V. L. Wazir.
37. Sardar Datar Singh.
38. Mr. R. G. Allan.

Mr. N. C. Mehta, I.C.S., *Secretary.*

Visitors—

Prof. A. C. Aggarwala.
Mr. M. Alam.
Mr. D. V. Bal.
Dr. J. K. Basu.
Mr. W. E. Bushby.
Mr. A. P. Cliff.
Dr. N. R. Dhar.
Mr. Dalip Singh.
Khan Sahib Dost Mohamad Khan.
Mr. S. Hidayatullah.
Mr. H. C. Javaraya.
Sardar Kartar Singh.
Mr. D. N. Khurody.
Mr. Z. R. Kothavalla.
Dr. P. G. Krishna.
Mr. R. W. Littlewood.
Prof. P. C. Mahalanobis.
Mr. R. N. Naik.
Pattagar of Palayakottai.
Mr. C. H. Parr.
Mr. B. Raghavan.
Dr. L. A. Ramdas.
Mr. Ramdhan Singh.
Mr. K. Ramiah.
Mr. C. B. Samuel.
Sardar Santokh Singh.
Mr. B. H. Schneider.
Mr. R. L. Sethi.
Mr. B. Sundararaj.
Mr. K. I. Thadani.
Mr. R. Watson.
Mr. R. C. Woodford.

2. *Application from the Government of Bombay for a grant of Rs. 41,075 spread over five years for a scheme of research in economic ornithology by Mr. A. Salim Ali. (Subject No. 7 on the agenda). (Appendix IV.)*

The Chairman in introducing the subject said that it was decided at the last meeting that the work should be carried out at one centre only. The scheme had been considered by a sub-committee of entomologists. The recommendations of the sub-committee were—

1. The work should be done at a major entomological laboratory where there was a full-time economic entomologist and facilities were offered both at Delhi and Lyallpur.
2. It was quite clear that the qualifications of an Economic Ornithologist were a sound knowledge and experience in field ornithology and that academic degrees were not in this case necessary.

As Dr. Burns had pointed out this was really a proposal to give a grant to enable a particular person to carry out this work. As revised by the sub-committee the scheme would cost Rs. 4,000 per annum. The question of the period for which the scheme should be worked was still to be decided ; the original proposal was for five years.

Dr. Burns said that this was a very specialised work and that so far he had not known any one who had the same experience and qualifications as Mr. Salim Ali. He said that as the scheme was modified out of recognition he would recommend its rejection. Mr. P. H. Carpenter seconded the proposal of Dr. Burns. The Board decided that the scheme should not be proceeded with.

3. *Reports of the three sub-committees appointed to consider the draft Briefs for Experts in connection with the scientific survey of the work in progress and contemplated under the auspices of the Imperial Council of Agricultural Research. (Subject No. 3 on the agenda). (Appendices III and III-A).*

Discussion was resumed of Brief on Dairying in India. (Annexure III of Appendix III-A).

Paragraph 40.—The amendments suggested by the sub-committee were approved. It was pointed out in the course of discussion that the last sentence of paragraph 40 would require correction in view of the amendment approved in connection with the Pusa herd in paragraph 39.

Paragraph 41.—The amendments suggested by the Committee were approved. Mr. Jenkins pointed that no mention was made of the Sindhi herd at Mirpurkhas in Sind, which was the home of that breed. Mr. K. MacLean said that there was also a Sindhi Herd at the Dacca Farm. The Chairman requested Messrs Jenkins and MacLean to supply the necessary details relating to the Sindhi Herds at Mirpurkhas and Dacca respectively.

In this connection Mr. Quirke said that he could supply details about the two Punjab Government Grantee Cattle Breeding Farms, the Jehangirabad and the Allahabad, which could be incorporated in paragraph 39. Mr. McDougall said that he could supply information about the herd in

the Telinkheri Farm in the Central Provinces for inclusion in paragraph 39. The Chairman said that he would include all this information if it was supplied by the end of July.

Paragraph 41.—The amendments suggested by the sub-committee were approved.

Paragraph 42.—Mr. Littlewood suggested that the last but one sentence of that paragraph should read as follows :—

> "The average lactation yield of the foundation herd was 2,674 and that of the farm-bred cows was 3,251 lbs. including the *first calvers* or 3,526 lbs. excluding *first calvers*".

The amendment mentioned above as well as the amendments suggested by the sub-committee were approved by the Board.

Paragraphs 42 and 43.—The amendments suggested by the sub-committee in these two paragraphs were approved by the Board.

Paragraph 44.—Mr. Allan said that the figures given in this paragraph as to the effect of better feeding were exaggerated. He had previously pointed out the same thing in connection with the figures given regarding the feeding of cows. Colonel Olver said that he did not attach special importance to these percentages at all and he did not mind if these figures were omitted altogether. The Chairman suggested that in line 6 of this paragraph instead of the words "11 per cent as against 50 to 64 per cent in cows", the following should be substituted :—"smaller than in the case of cows". This amendment as well as those suggested by the sub-committee were approved.

Paragraph 45.—The sub-committee had recommended the deletion of this paragraph. It was explained at the meeting that the omission of the Kangayam breed of cattle was recommended as it was purely a draught breed. The Board recommended that the record of the *Surti* buffaloes maintained at Poona should be obtained and included in the draft.

Paragraph 46.—The amendments made by the Committee were approved.

Paragraph 47.—Mr. Jenkins said that he was somewhat surprised to see Bhagnari cattle included in the Indian Dairy Breeds. Colonel Olver said that it was certainly a draught breed, though some of them were good milkers. It was agreed that the sub-heading should be 'Other Indian Breeds' as this list dealt with breeds with potentialities. Mr. McDougall suggested that line 24 on page 9 of the report of the sub-committee, should read as follows :—

> "Nagpuri Buffalo............(Bombay, Central Provinces and Berar)."

Mr. Quirke and Sardar Datar Singh suggested that line 28 on page 9 should read as follows :—

> "Nili or Ravi......................(Punjab)."

The suggestions mentioned above as well as as those made by the committee were approved by the Board.

Paragraph 48.—The amendments suggested by the Committee were approved.

Paragraph 49.—Mr. Quirke said that in this paragraph mention should be made of the work done on the Jumna Pari goats at the Hissar Farm in addition to what has been said about the work at Etah. This breed was locally known as ' Beetal '. Mr. Quirke promised to supply the necessary note for inclusion.

Paragraph 50.—The amendments suggested by the sub-committee to this paragraph were approved.

Paragraph 51.—Mr. Fotidar said that there was no such breed of goats as ' Kashmiri ' goats. The description given in the note applies to Tibetan goats which are bred up in Tibet. He suggested the deletion of the paragraph dealing with Kashmiri goats. This suggestion as well as the amendments suggested by the sub-committee were approved.

Paragraph 52.—The Chairman moved the following amendment to second sub-paragraph.

In the place of the sentences beginning in line 9 and ending in line 20 substitute the following :—

> " The scientific activities of the Imperial Dairy Expert have necessarily been limited by the funds available and by the fact that the Dairy Farms and Creamery were expected to be self-supporting. At the time of the financial crisis in 1931 the provision for the Bangalore and Karnal farms was greatly reduced. The Anand Creamery was closed and the scope of the Wellington Farm greatly reduced. The post of the Assistant Imperial Dairy Expert was held in abeyance. After these reductions were made the nett cost to the Government of India of assistance to the Dairy Industry was Rs. 86,000 per annum."

The amendment mentioned above as well as those suggested by the sub-committee were approved by the Board.

Paragraph 53.—The amendments suggested by the sub-committee to this paragraph were approved by the Board.

Paragraph 54, page 26.—Rao Bahadur D. Ananda Rao suggested that under the heading " Madras ", the words " Agricultural stations and " should be added after the words " Government at ".

Page 27.—Under the heading " Bengal " Mr. Kerr suggested the addition of the words " Agricultural and " between the words " Provincial " and " Veterinary " in second sub-paragraph.

It was decided to substitute the words " general utility " in place of " dual purpose " under the heading " Central Provinces ".

Page 28.—Dr. Schneider undertook to furnish some further details about the cattle maintained at the Allahabad Agricultural Institute for incorporation under the heading " U. P.".

Page 29.—It was decided that a complete record of the progeny of the 34 bulls should be added at the end of the paragraph dealing with the " North-West Frontier Province ", and that the figure " 178 " occurring in the second line of that paragraph should be changed into " 229 ".

It was decided not to accept the recommendation of the Sub-Committee regarding the omission of the first sentence under the heading " Bihar and Orissa ".

It was also decided that the word " Shahabad " should be substituted for " Hissar " under the heading " Sabour and Patna ".

It was decided that the following addition be made at the end of the sentence concluding with the words " Tharparkar herd ", *viz.*, " it having been shown that the Tharparkar is a suitable sire for the improvement of local cattle for purposes of milk production ".

It was decided that a foot-note should be added at the bottom of page 29, as follows :—

" Now 2 separate provinces, Bihar and Orissa."

Under the heading " Assam " Mr. Woodford suggested the addition of the following sentence at the end of the 1st paragraph :—

" One Government farm is enough for meeting the requirements of Shillong."

The suggestion was accepted.

It was decided that the word " extensively " occurring in the second line of the last paragraph on page 29 should be deleted and that the word " Assam " in the same line should be changed into " Sindhi ".

It was also decided that the words " if fresh Sindhi blood were frequently infused " occurring at the end of the last paragraph on page 29 should be changed into " by using Sindhi blood ".

Page 31.—Mr. Allan suggested that the following sentence be added after the words " animal industry " under the heading " Baroda ", *viz.*, " but a herd of Kankrej cows and Chharotar buffaloes is being built up at the Palace Dairy ". The Chharotar buffalo is slightly different from the Surti and is known locally by that name. The word Chharotar covers the district of Khaira.

Under the heading " Mysore " it was decided to substitute the words " His Highness the Maharaja of Mysore " in place of the words " the Government ".

Mr. Jenkins promised that a note on cattle improvement work done in Sind would be sent up by the end of July.

Raja Jagannath Baksh Singh suggested that the question of the disposal of milk in the villages should be investigated further. The Chairman pointed out that all the available information that could be had would be supplied to the Expert including that of the special enquiry.

Page 4.—It was decided that the figure for " Madras " should be .18 or 2 oz. Mr. Quirke suggested the addition of a new paragraph summarising the work done on buffalo breeding. This was accepted. Messrs. Parr and Quirke promised to supply the necessary data.

Maulvi Fateh-ud-Din said that the underlying point of Mr. Quirke's suggestion was that the buffalo was an important milch animal and that point should be emphasised. It was not merely a question of collecting information from the provinces. The Chairman said that on receipt of the necessary information the idea would be incorporated.

Mr. Quirke enquired whether it was not possible to include the question of economics of milk production of buffaloes in the brief. The Chairman said that that point was dealt with in paragraph 48.

With the detailed modifications mentioned above the brief on " Dairying in India " was approved by the Board.

Appendices.

The Chairman moved that the Committee's recommendations suggesting various amendments in the appendices be accepted. This was accepted unanimously.

Dr. Shaw suggested that the figures about the budget of the Imperial Department of Agriculture, given in the concluding portion of the paragraph on page 72 to be checked by the office of the Director, Imperial Institute of Agricultural Research. The suggestion was accepted. Mr. Kothavalla said that he believed the figures which were supplied by his office to be correct. The Chairman desired Mr. Kothavala to have the figures confirmed.

Page 48.—The statements as amended by the Committee were accepted unanimously.

4. *Report of the Sugar Committee (not printed). (Subject No. 8 of the Agenda.)*

A.—PROGRESS REPORTS ON RESEARCH SCHEMES. (APPENDIX V).

The Chairman explained that the various progress reports on sugarcane research schemes had been considered by the Sub-Committee of the Sugar Committee of the Council, and the report of former was in turn closely examined by the Main Committee.

Progress report on the working of the Sugarcane Research Station in the Bombay-Deccan, Padegaon, for 1934-35. [Item 8-A (ii) of the Agenda]. (Appendix V).

The Chairman said that the soil work on this scheme had been discussed by the Soil Science Committee and that a separate report thereon (Appendix XXXVIII) will be circulated to the Board. The recommendations of the Sugar Committee were adopted.

The Report of the Committee on progress reports on sugarcane Research Schemes as per items 8-A (*ii*)—(*v*) was adopted. (Appendix V).

Progress report on sugarcane work at the Jorhat Experiment Station, Assam, during 1934-35. [Item 8-A (vii) of the Agenda]. (Appendix V).

Dr. Mitra pointed out that the grade of the Farm Manager in th Assam scheme was not Rs. 60 to 120 as observed by the Sugar Committe but was Rs. 80—200, and suggested that the mistake should be rectifie Dr. Mitra also enquired if they could appoint a Senior Assistant to tak charge of the work. The Chairman observed that the Sub-Committee o the Sugar Committee was not satisfied with the work done in connectio with the scheme and that it was proposed that the work should be inspecte in the first instance by one of the Senior Officers of the Imperial Counci of Agricultural Research who would also advise the Council as to th necessity for a more highly qualified Assistant. The Sub-Committee' report was adopted.

The report of the Committee on the remaining items under 8-A o the Agenda (Appendix V) was adopted unanimously.

B.—General.

Review of the quality of sugar manufactured in India by central sugar factories and refineries during the season 1935-36. [Item 8-B (i) of the Agenda]. (Appendix VI).

This was largely for information, and was recorded.

Report on the working of the Bureau of Sugar Standards for 1935-36. [Item No. 8-B (ii)]. (Appendix VI).

The Chairman observed that the report was considered by the Sub-Committee whose recommendations were confirmed by the main committee. He added that the sugar position in India had by now practically reached the level of consumption, and it was necessary that the marketing of Indian sugar should be organized.

Sir C. V. Raman enquired as to who was to examine and certify the actual quality of sugar which was to be stamped. The Chairman replied that it was hoped to set up a regular sugar trade association for the purpose. The recommendation of the sugar committee was adopted.

Report on the utilisation of bagasse for the paper and board industry by Mr. M. P. Bhargava, Officer-in-Charge, Paper Pulp Section, Forest Research Institute, Dehra Dun. (Grant recommended Rs. 15,000). [Subject No. 8-B (iii) of Agenda]. (Appendix VI-A).

Mr. Canning said that if the grant of Rs. 15,000 asked for was sanctioned, the Forest Research Institute, Dehra Dun, would be able to take up the necessary investigation and research in connection with the scheme. The vast extension of cane cultivation had increased the demand for wood fuel in some areas already. He thought that the prospects of the utilisation of bagasse for the paper and board industry were very promising. It might be possible to utilise bagasse in the production of 'mechanical' paper pulp. Mr. Brodie said that his Department had received proposals for the manufacture of *insulated* boards from bagasse, and asked Mr. Canning if that aspect of the matter would also be considered by the Forest Research Institute. In other countries cellotex was being manufactured from bagasse. Mr. Canning replied that it was for this very purpose that part of the additional plant was required and that the possibilities of the manufacture of cellotex from bagasse would be investigated. The Chairman said that the Council was very grateful to

the President of the Forest Research Institute for this offer of co-operation. The resolution recommending the grant of Rs. 15,000 to the Forest Research Institute was then passed unanimously.

C.—PROPOSALS FOR EXTENSION OF SUGAR RESEARCH SCHEMES.

Application from the Director, Imperial Institute of Agricultural Research for Rs. 1,11,000 spread over five years for the continuation of research on mosaic and other diseases of sugarcane. [Item No. 8-C (i) of the Agenda]. (Appendices VII and VII-A).

The Chairman made it clear that it was not supposed that this work would be finished at the end of 2 years for which period the scheme was recommended to be extended by the Sugar Committee, but that it was felt that when it had been proved that the grants of the Council to an Imperial Research Station had enabled valuable work to be done and that there was need for the continuance of it, it was hoped that the Government of India might take the work over as a permanent extension of the Imperial Research Station concerned, thus making the Council's grants available for new schemes. The report of the Sugar Committee on the subject was adopted unanimously.

Application from the Government of Bombay for Rs. 4,24,000 spread over five years for the continuance of the sugarcane research scheme in the Bombay-Deccan. [Item No. 8-C (ii) of the Agenda]. (Appendices VII-B, C, D and E).

Dr. Burns, commenting on the Report of the Sugar Committee on the scheme mentioned above fully explained the work that had been done at the Sugarcane Research Station in the Bombay-Deccan, Padegaon, where the scheme had finished its first 5 years for which period it was sanctioned by the Council in the first instance. He added that the present application for extension was very fully considered by the Sugar Committee whose recommendations he had accepted, *viz.*, reduction of the period from 5 to 3 years, omission of the sub-station and the retention of the Agricultural Officer as an essential part of the scheme. With these modifications, the cost of the extension scheme under consideration came to Rs. 2,48,000 out of which Rs. 74,000 were offered by the Government of Bombay which meant 30 per cent. contribution from the Local Government. He explained in detail what amount of work they had already done in this particular line, and repeated his objections, which he had raised in the meeting of the Sugar Committee, to the observance of the 50 : 50 principle rigidly in respect of the Bombay Scheme which was not only of interest to the Bombay Presidency but was to a large extent of great importance to soil physiologists of other provinces. He said that the idea of 50 : 50 contribution was first brought out by Sir Joseph Kay particularly with reference to the general method of financing new schemes (there were no extension schemes then) ; but he asserted that the exact proportion of the Council's contribution and that of the Local Government should depend on negotiations with the Local Governments concerned. The new schemes that come up for allotment of funds might be examined with the 50 : 50 principle in view but in case of the schemes which had already run for some time, and funds were now required for their extension, this principle should not be applied ; otherwise the provincial budgets would be put entirely out of joint.

He said that in case the scheme was found to be useful and the Imperial Council of Agricultural Research had no money there were only two ways of meeting the situation, either by way of moratorium on all new schemes or by asking for more money from the Government of India.

Dr. Burns said that considering that good work had been done on this station and as it was difficult to find money from ordinary grants for local problems, Dr. Burns moved an amendment " That the present offer of the Local Government to provide the contribution mentioned in its proposals, be accepted and that the 50 : 50 ratio be not insisted on ".

The Chairman confirmed the statement that good work had been done and was being done on this scheme. He had visited Padegaon last October. As regards the question of cost, one of the tasks of the Imperial Council of Agricultural Research was the promotion and development of agricultural research as well as the financing of it. The Council could not expect unlimited funds from the Government of India and they had a warning that schemes should not be sanctioned beyond their regular income. It by no means followed that in any particular year the Government of India would be in a position to give special grants. It therefore behoved the Council to go carefully. It was decided last time that the 50 : 50 basis should be the normal recommendation for renewals and the Sugar Committee had taken a similar view. It was not necessary for our recommendation or of the Sugar Committee that the Local Government would have to pay the difference between 30,000 and 1,25,000. It was pointed out in the Sugar Committee that in the Bombay-Deccan practically all the cane made into sugar was grown by the factories themselves. There was also a very considerable area grown for *gur* by small cultivators. It was suggested that having got so much good out of the station already, the sugarcane factories in the Deccan might put up the difference if the Bombay Government were unable to do so. He said he was bound to support the recommendation of the Sugar Committee that the Imperial Council of Agricultural Research should only provide 50 per cent. of the cost of the scheme.

Dr. Mitra said that the insistence on the contribution of 50 : 50 would be very hard on the province of Assam, and made it practically impossible for any new schemes to be submitted.

Sir C. V. Raman supported the views of the Chairman. He said that his own feeling was that the Imperial Council of Agricultural Research should be a pioneer to support and put forward new schemes to help new ideas ; but when a stage had been reached as had been reached in the present case, and the utility of the scheme to the area was demonstrated, it was up to the provincial Government to find a substantial part of the money required for the contribution of the other research. Such provision was clearly essential. If it was suggested that the provincial Government had not the money, it was clear indication of the fact that the scheme was not worth while from the point of view of the area concerned. There was no reason why the Imperial Council of Agricultural Research should find all the money. He felt strongly that in the case of schemes which were already in operation for a considerable period, it was essential that the Local Government should find a substantial part of the cost.

Mr. Carpenter agreed with Sir C. V. Raman and said that as 50 per cent. was made up of local sources, the scheme should be supported especially as the work done on it was valuable.

The Chairman explained that he had also suggested to the Director of Agriculture, Bombay, another indirect way by which the Bombay Government could make up the 50 per cent. required by the Sugar Committee.

The amendment moved by Dr. Burns and seconded by Dr. Mitra was put to vote and lost by a majority.

Application from the Government of Bihar for a grant of Rs. 1,49,150 spread over five years for the extension of the sugarcane research scheme for five years from March 1937. [Items 8-C (iii) of the agenda]. (Appendices VII-F and G.).

The application for the renewal of the scheme was also considered in the Sugar Committee and subject to certain small economies was passed.

Dr. Shaw explained the Committee's report which was adopted by the Board.

D.—PROPOSALS FOR NEW SUGAR RESEARCH SCHEMES.

Application from the Government of His Exalted Highness the Nizam of Hyderabad for Rs. 31,535 spread over five years for a scheme of sugarcane research in Hyderabad. [Item 8-D (i) of the agenda]. (Appendices VIII, VIII-A and B.)

The Committee's report was explained by Dr. Shaw. The Sugar Committee, considering the scheme on a wider basis, thought it was not desirable to extend the Council's chain of sugar stations in the Hyderabad and recommended that the scheme be dropped. That recommendation was now before the Board.

The Chairman said that this was a small scheme which the Hyderabad Government could appropriately do for itself. It was a small local problem with no all-India aspect, and the Sugar Committee felt that they could not recommend a grant to the Council. The application was rejected.

5. *Annual reports of Veterinary Investigation Officers in the provinces (except North-West Frontier Province) and in Hyderabad State for 1935-36. [Item 9 (i) of the agenda]. (Appendix IX).*

Colonel Olver explained the report of the sub-committee (Appendix X) which was accepted by the Board.

Bombay report.—Colonel Olver explained the sub-committee's report which was accepted by the Board.

Bengal report.—Colonel Olver explained the sub-committee's report which was adopted unanimously.

United Provinces report.—Colonel Olver explained the sub-committee's report which was accepted unanimously.

Punjab report.—Colonel Olver explained the sub-committee's report which was accepted.

Bihar and Orissa.—Colonel Olver explained the sub-committee's report which was accepted by the Board.

The report of the sub-committee on the progress report of the Veterinary Investigation Officer, Central Provinces and Berar, was approved.

Colonel Olver introduced the report of the Veterinary Progress Report Committee on the annual report of the Assam Veterinary Investigation Officer. Rai Sahib Ghosh moved the following amendment :—

Line 4 of the Committee's report should read as follows :—

> " Government farms, village cattle obtained from the farms or which were in association with the farm cattle and even goats in the Sylhet Farm had."

The Board did not approve of this amendment.

Mr. Kerr said that this matter was carefully considered at the Committee and the spread of the disease was a thing of the past. Mr. Ware moved the following amendments to the report :—

For line 4 substitute the following : " Government farms and amongst village cattle which have been in association with animals issued from the Government farms and even goats had ".

Add the following words after the word " Ostooporosis " in line 16 of the report :

> " and his conclusion regarding the identity of the parasite causing hump sore were premature and should be accepted with caution."

Mr. Ware's amendments were accepted by the Board. The report of the sub-committee as amended was approved by the Board.

Colonel Olver introduced the report of the sub-committee relating to the Annual Report of the Hyderabad Veterinary Investigation Officer and this was approved by the Advisory Board.

The Vice-Chairman said that recently he had an opportunity of visiting the Muktesar Institute where he saw the co-ordinated work between the Institute and the Veterinary Investigation officers in the Provinces. He said that the Council might well congratulate itself in having started this scheme, for the cattle diseases in India were now being studied with a precision which was not previously possible. Mr. Carpenter drew attention to the united opinion of the Veterinary officers which was expressed in connection with the report of the Bombay Investigation Officer and said that it would not have been possible if the Council had not started the scheme.

6. *Annual Report for 1935-36 on the Johne's disease investigation scheme in Mysore. [Subject No. 9 (ii) on the agenda]. (Appendix IX.)*

Colonel Olver introduced the report of the sub-committee on the Johne's disease scheme in Mysore which was adopted by the Board.

7. *Annual Report for 1935-36 on the Central Provinces Goatvirus vaccination scheme. [Subject No. 9 (iii) on the agenda]. (Appendix IX).*

Colonel Olver introduced the report of the sub-committee and said that the words ' free of cost ' should be added in line 16 on page 8 of the sub-committee's report after the word ' vaccinated '.

Mr. Garewal suggested the omission of the following words occurring in lines 30 to 31 on page 7 of the sub-committee's report : " partly at the expense of the District Council ".

The amendments mentioned above were accepted by the Board and then the Board adopted the report of the Committee as amended.

8. *Application from the University of Madras for a grant of Rs. 21,300 spread over five years for a scheme for enquiry into helminthiasis of cattle in the Madras Presidency. (Subject No. 10 on the agenda). (Appendix XI).*

Colonel Olver introduced the report of the sub-committee. Mr. Saunders said that he had no other alternative but to accept it and that he would send up a scheme as soon as possible. The report of the sub-committee was adopted by the Board.

The Advisory Board adjourned at 1-10 P.M. for lunch to resume again at 2-45 P.M.

9. *Consideration of the difficulties in securing material for plant breeding work. [Subject No. 18 (i) of the Agenda]. (Appendix XII).*

Dr. Shaw, in explaining the recommendations of the Botanical Sub-Committee (Appendix XIII) on the subject, said that the Sub-Committee considered it desirable to maintain a larger range of type collections of crops, and suggested that the Imperial Council of Agricultural Research should address a circular letter to all Provincial Governments and States Departments of Agriculture, enquiring what they could do in the matter of the maintenance of type collections of crop varieties. The Advisory Board adopted the Report of the Sub-Committee on the subject and desired that the information gathered on the subject should be submitted to the future meeting of the Board.

Dr. Hidayatulla said that in Bengal they maintained over 1,000 pure line cultures for their own purpose. In answer to a query from the Chairman, Dr. Hidayatulla said that they had been keeping all these classified varieties for the past 10 years.

Mr. Alam said that the maintenance of pure lines would not be very difficult, and that in maintaining 1,000 to 2,000 cultures, only an acre of land was required for it was a matter of keeping only one row for about 30 plants in each culture.

Dr. Mitra said that in Assam they were maintaining about 1,000 pure line cultures of paddy.

Dr. Shaw said that the Committee visualised a possible division of work in the Provinces and the Imperial Council of Agricultural Research.

Mr. Jenkins enquired whether this work could not be done from a regional point of view, *e.g.*, by co-operation between Sind, Punjab and North-West Frontier Province, for instance, not only for rice but also for other crops including wheat. It was agreed that there was scope for such arrangements.

The Chairman asked members whether the British Commonwealth Scientific Conference could be informed that in India the type collections of crops mentioned in the list given in the report of the Sub-Committee could be maintained. Dr. Shaw desired to add to the list a number of other crops after the replies to the Imperial Council of Agricultural Research circular letter mentioned above had been received.

Dr. Burns and Mr. McDougal proposed the addition of Sorghums to the list. The Board agreed. *Bajra* and *Ragi* were also added.

The second point for the consideration of the Board was as to what extent botanists in India were willing to receive material from other parts of the Empire and to grow and maintain it for purposes of comparison with the varieties of crops grown in India, as it was advantageous to have an exchange of this kind.

Dr. Shaw said that most of the botanists in India would be willing to receive material from abroad and grow it, but if the types proved to be of no economic value, it would be a waste of time, to maintain them all. The Chairman pointed out that any such scheme would have to be reciprocal and that we should have to undertake a little work for the benefit of those countries which helped us with material. He referred to what had already been done regarding pulses.

Dr. Mitra said that he had tried varieties of rice from the United States of America, Japan, Italy and some other places, but none of them had proved successful so far. They had been used for cross-breeding purposes.

Dr. Shaw said that the feeling of the Committee was to concentrate on maintaining Indian varieties at first.

Mr. Kadam said that for cross-breeding purposes, provincial plant breeders would be well advised to try foreign varieties as well. This was very important from the point of view of genetics.

The Chairman in summing up said that it was clear that botanists in India would be willing to receive a considerable number of types from abroad for growth and comparison with the indigenous varieties but as many of these would have no direct economic value the number of foreign varieties which could be maintained would be very much smaller than the total number received for examination. The point could however be examined in detail in due course.

In regard to the collection of potato breeding material, the Board passed the following resolution :—

> "The Advisory Board, Imperial Council of Agricultural Research, desires to emphasise the importance of recommendation No. 3 (*ii*) in the report of the Potato Research Sub-Committee, dated the 23rd February 1934, regarding the possibility of an expedition to South and Central America, in co-operation with other parts of the Empire, for the collection of potato breeding material."

The resolution was carried unanimously.

10. *Surveys of plant breeding material* [*Subject 18 (ii) of the agenda*]. (*Appendix XII-A.*).

The subject was introduced by Dr. Shaw. In answering to a query from Dr. Burns, Dr. Shaw explained that the sub-committee had not in mind the re-numbering of the varieties already existing, nor did the sub-committee desire to prevent people from using the commercial names of varieties in general cultivation. After several questions had been answered, the sub-committtee's report was adopted unanimously.

Members were then requested to send in their proposals as soon as possible so that an all-India list could be prepared in good time and the various varieties registered and numbered.

11. *Annual report* on the working of the Botanical sub-station, Karnal, for 1934-35* [*item 20 (ii) of the agenda*].

Dr. Shaw explained the sub-committee's report (Appendix XIII) and moved its adoption.

In answer to a question from Mr. Sethi, Dr. Shaw said that the sub-station was now being transferred to Pusa. The report was accepted unanimously.

12. *Progress report* for 1935-36 on the scheme of research on the cultivation of medicinal plants and the study of food poisons by Bt.-Col. R. N. Chopra* [*item 20 (iii) of the agenda*].

Dr. Shaw explained the recommendations of the sub-committee (Appendix XIII) which were adopted by the Board unanimously.

13. *Annual report* for 1935-36 on the Hyderabad Castor breeding scheme* [*item 20 (iv) of the agenda*].

Dr. Shaw explained the recommendations of the sub-committee (Appendix XIII).

Dr. Burns suggested that it would be worth while to get Ceylon and Queensland varieties for study as the difference in yield was great. The suggestion was accepted.

With this amendment, the sub-committee's report was adopted.

PROGRESS REPORTS ON AGRICULTURAL RESEARCH SCHEMES—METEOROLOGICAL AND STATISTICAL.

14. *Annual report* for 1935-36 on the scheme of statistical studies by Professor P. C. Mahalanobis* [*item 21 (i) of the agenda*].

Mr. Carpenter introduced the subject and explained the views of the sub-committee (Appendix XV) on this very interesting scheme which were adopted by the Board.

15. *Annual report of work on the Agricultural Meteorology Branch for the year ended 21st August 1935.* [*Subject No. 21 (ii) on the agenda.*] (*Appendix XIV.*)

Mr. Carpenter introduced the report of the sub-committee which was adopted by the Board. At the same time, he pointed out that the Sub-Committee has been dealing with only certain sections of the report and it seemed desirable to point out that the remainder of the report was of

*Not printed.

much interest. In this connection the Chairman drew attention to the impossibility of getting diagrams printed at short notice. He, therefore, requested the authors to restrict the number of diagrams as far as possible. Where diagrams, graphs were essential, tracings of the standard size of the Board's proceedings, should be supplied as well as the usual drawings so that if blocks could not be prepared a few ferro-prints could be made. In this particular case the difficulty in getting the diagrams printed was responsible for the delay in having the report printed and circulated to the members of the Advisory Board.

16. *Application from the Government of Orissa for a scheme of rice research at a cost of Rs. 1,37,395. [Item No. 12 (iii) of the Agenda.] (Appendix XVI.)*

Dr. Shaw explained the scheme and the sub-committee's report (Appendix XVII). There was considerable discussion in connection with recommendations Nos. 6 and 7 of the sub-committee. In the end the Chairman put the following proposition to the Board :—

The report of the sub-committee be adopted on the understanding that if the Assistant Botanist in the Bihar scheme is not available for transfer to Orissa as Paddy Specialist, Orissa, will be filled by recruitment through the Public Service Commission in the usual way.

The proposition was unanimously adopted.

17. *Application from the Government of Bihar for extension of the rice research scheme, Bihar, for a further period of five years from 20th January 1937 at a cost of Rs. 1,56,374. [Item No. 12 (i) on the agenda of the Board.] (Appendix XVI-A.)*

Dr. Shaw introduced the report (Appendix XVII) of the sub-committee. Mr. D. R. Sethi said that in view of the fact that three-fourths of his work was on the botanical side, he wanted a second botanist rather than a physiologist. He therefore moved an amendment that the post of Assistant Botanist be retained, the post of Physiologist be retrenched and that instead of a Junior Research Assistant on Rs. 80—4—100, a senior research assistant on a pay of Rs. 130—7—158 be provided for physiological work. Mr. R. L. Sethi was of the opinion that botanical and genetical work were certainly of more importance than physiological work in this particular case.

In answer to a query from Dr. Nazir Ahmed the Chairman said that Professor Parija's work at Cuttack would be in connection with the flood resistance and the tolerance of saline conditions.

Mr. Sethi's amendment to the sub-committee's report was adopted by the Board.

The report of the sub-committee as amended was adopted by the Board.

Mr. Sethi drew attention to the views of the Bihar Government on 50 : 50 contribution and said that the insistence on this principle would discriminate in favour of richer provinces and that it will be difficult for the poorer provinces to renew the scheme. This would mean mean that the work done hitherto would be wasted.

Sir C. V. Raman said that there was no reason why there should be any discrimination in favour of Bihar when the principle was adhered to in the case of Bombay.

The recommendation of the sub-committee on this point also was approved by the Board.

18. *Application from the Government of Bengal for a grant of Rs. 1,41,333 spread over a period of five years for the extension of the rice research scheme in Bengal.* [*Item 12 (ii) of the Agenda.*] (*Appendices XVI-B and C.*)

The Chairman explained that the scheme was originally financed for a period of 5 years by the Empire Marketing Board. In future whatever grant was made would come out of the Imperial Council of Agricultural Research Funds. Dr. Shaw explained the recommendations of the Rice Research Sub-Committee (Appendix XVII). Mr. McLean said that he accepted the recommendation of the Committee in regard to this scheme but was not in a position to give an assurance that the Bengal Government would pay a 50 per cent. contribution. The Sub-Committee's report was carried unanimously.

19. *Progress report (not printed) of the Bihar and Orissa Rice Research Scheme 1935-36.* [*Item 11 (iv) of the Agenda.*]

Dr. Shaw introduced the Sub-Committee's report (Appendix XVII). The Chairman pointed out that the important point for the rice research officers to note was that in manurial experiments with nitrogenous and phosphatic manures, emphasised by the Fertilisers Committee, attention should be paid to the ratios of nitrogen and phosphate and not to the empirical comparisons of commercial fertilisers. Dr. Bal pointed out that ammophos was not equivalent to sodium nitrate *plus* ammonium phosphate, and suggested that the statement on page 44 of the Progress Report be amended accordingly. With this explanation the report of the Committee was adopted.

20. *Report of work done at Coimbatore in connection with investigation on the quality of rice.* [*Subject No. 11 (vi) of the Agenda.*]

In introducing the sub-committee's report (Appendix XVII) Dr. Shaw said that the committee were not happy about the work done in regard to the quality of rice.

The Chairman in explaining the position said that a scheme on the quality of rice was in progress under Professor Subrahmanian at the Indian Institute of Science, Bangalore, who was co-operating with the Paddy Specialist, Coimbatore, who was an officer of the Madras Department. In order to enable the Paddy Specialist to do so, the Council had agreed that one of the Assistants in the Madras Rice Scheme might be used for the purpose and stationed at headquarters instead of Berhampur.

As regards the work in connection with the marketing of rice, the Paddy Specialist at Coimbatore had carried out a good deal in the way of tests on cooking and milling qualities of rice because facilities for carrying out such tests were available in his laboratory at Coimbatore. The Chairman suggested that the next time when the report of this work came in, there should be a joint account of the work being done by the Paddy

Specialist at Coimbatore and the officer who was doing it under Professor Subrahmanian at Bangalore.

Rao Bahadur Ananda Rao in further explaining the matter said that the work on quality of rice was being dealt with at Coimbatore and Bangalore. At the former place histological work was being done, while at the latter place nutritional work was being done. For work at Coimbatore the staff was provided by the Madras Government whereas at Bangalore the Council provided it. But the Council had later agreed that the 4th Assistant provided in the Rice Research Scheme, Berhampore, could be utilised for the work. Before, however, that assistant could be appointed, the Agricultural Marketing Adviser to the Government of India proposed that samples of market varieties of rice should be tested at Coimbatore and in this connection, this assistant should help the Paddy Specialist, Coimbatore. The delay in carrying out work on the quality of rice at Bangalore was therefore due to this reason. He however assured the Board that in view of the fact that the Assistant concerned had now practically finished the analytical work on rice, the work at Bangalore would be done more expeditiously.

The Report of the Committee was adopted.

21. *Programme of work for the Horticultural Research Station, Krishnagar, Bengal, for the year 1936-37. [Item 23 (iii) B of the Agenda.] (Appendix XVIII.)*

Dr. Shaw explained the recommendations of the sub-committee (Appendix XIX) which were adopted unanimously.

22. *Final report* of the scheme of research on the wither tip of citrus trees by Dr. H. Chaudhry. [Item 23 (iv) of the Agenda.]*

Dr. Shaw explained the recommendations of the Sub-Committee (Appendix XIX) which were accepted unanimously.

23. *First report* on the work done under the fruits and vegetable preservation scheme, Punjab. [Item 23 (v) of the Agenda.]*

The recommendations of the Sub-Committee (Appendix XIX) were explained by Dr. Shaw.

Khan Bahadur Fateh-ud-Din pointed out that the prices of empty bottles given were actual prices as the bottles were made at Ambala and not imported and the cost did not include overhead charges. With this reservation, the report was adopted.

24. *Application from the Government of the Punjab for a grant of Rs. 29,820 spread over five years for a scheme for a survey and control of fruit diseases in the Punjab by Dr. Chaudhry, Punjab University. (Item 24 of the Agenda.) (Appendix XX.)*

Dr. Shaw explained the recommendation of the sub-committee (Appendix XIX) which was then adopted and the scheme dropped. The scheme was rejected unanimously.

25. *Application for the extension of the Bombay cold storage research scheme for a period of three years with effect from 1st March 1937 at a total cost of Rs. 50,188. [Item 31 (a) of the Agenda.] (Appendices XXI and XXI-A.)*

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*Not printed.

Dr. Shaw explained the recommendations of the sub-committee (Appendix XIX). Dr. Burns said that the work dealing with the scheme had been carried to a stage where definite recommendations could be made.

The work on potatoes was in progress and work on bananas had been taken up. Considering the preliminary results obtained with oranges and mangoes kept in cold storage, it was obvious that the price of cold storage fruits placed in the market at a time when fruits were not available, would make a lot of difference. He therefore commended the scheme to the Board. The recommendation of the sub-committee was unanimously adopted.

26. *Application from the Government of Bombay for a grant of Rs. 11,019 spread over three years for a scheme of gas storage of fruits and vegetables. [Item 31 (b) of the Agenda.] (Appendices XXI-B and C.)*

The recommendations of the sub-committee (Appendix XIX) were explained by Dr. Shaw. The period of deputation of the officer was to be about three months but the exact period should be left to the discretion of the Sub-Committee and the Council.

Dr. G. S. Cheema explained that this was a useful scheme. At present Alphonso mangoes could be kept in cold storage for about 60 days, but if the gas apparatus was obtained, they could probably be kept for 90 days instead of 60 days. If it was possible to keep mangoes for 90 days, he expected that the export trade would develop.

It was essential that an officer should be trained in the special technique of gas storage which was a new problem. The deputation of an officer to Cambridge would do much to speed up results.

In reply to a query from the Chairman, Dr. Cheema said that the qualifications of the officer in charge of the cold storage at Poona at present were that he was a bio-chemist and Ph.D. of the Bristol University. He had already done bio-chemical work on fruit at Long Ashton. Dr. Cheema added that he was proposing a man for deputation who knew his job well and would be useful on coming out.

The Chairman said that considerable interest was being shown in cold storage and the Council relied very much on the Poona station for information of importance in connection with the cold storage of fruit and vegetables. The report of the sub-committee was accepted unanimously.

27. *Application for the extension of the scheme for experiments on the preservation of fruits and vegetables in the Punjab at a cost of Rs. 12,970 spread over two years with effect from the 9th November 1936. [Item 31 (c) of the Agenda.] (Appendix XXI-D.)*

Dr. Shaw explained the recommendations of the Sub-Committee (Appendix XIX). Khan Bahadur Fateh-ud-Din enquired whether in the event of the local Government not appointing the junior Assistant, the scheme would be continued.

Sir C. V. Raman pointed out that if necessary the Local Government might provide the salary of the Assistant.

The Chairman said that it was left to the Local Government's discretion to appoint a junior Assistant.

Khan Bahadur Fateh-ud-Din said that as he had to attend another committee meeting, he could not be present on the Fruits Sub-Committee when this question was discussed. They in the Punjab were spending Rs. 12,000 in connection with this scheme this year and they would be spending 3,000 annually. The Punjab Government's contribution was Rs. 18,000 against 12,000 which they were asking the Council to provide. The Punjab Government are putting up a laboratory on a semi-commercial scale and the annual running cost would be another Rs. 3,000. The Punjab Government were putting in connection with this scheme more money than they were asking from the Council.

The Chairman said the proposition was that as the Punjab Government had been spending Rs. 18,000 of new money on this scheme, they therefore asked that the Council should bear the expenditure of Rs. 12,000.

Mr. Allan pointed out that the results were to be applied to experiments carried on a commercial scale.

Dr. Burns pointed out that the same type of work such as fruit juice, canning of fruits and jam making had been done on a commercial scale by the Bombay Government for some years and in various other places. There were other domestic things in the scheme such as chutneys, ketchups, etc., which it was proposed to make on a commercial scale.

He felt that it was not necessary in such cases to come up to the Council for money.

The Chairman put Khan Bahadur Fateh-ud-Din's amendment that "Instead of meeting the cost of 50 per cent, the Council should meet the whole cost" seconded by Mr. Fotidar, to the vote. The amendment was lost by a majority.

The sub-committee's report was then adopted.

Khan Bahadur Fateh-ud-Din enquired whether the scheme would have to close down on the 1st of November if no money was to be given. The Chairman said that that was the position.

It was decided that the Advisory Board's recommendations should be communicated to the Punjab Government at once.

28. *Progress report for 1935-36 on Animal Nutrition Schemes.*

(*i*) *Dacca.* [*Subject No. 17* (*i*) *on the Agenda.*] (*Appendix XXII.*)—Colonel Olver introduced the report of the sub-committee (Appendix XXIII). Mr. MacLean accepted the recommendations of the sub-committee. The report of the sub-committee was adopted by the Board.

(*ii*) *Coimbatore.* [*Subject No. 17* (*ii*) *on the Agenda.*] (*Appendix XXII.*)—Colonel Olver introduced the report of the sub-committee (Appendix XXIII). Rao Bahadur Ananda Rao said that he would very much like to retain item (4) of the research programme. He said that preference would be given to the items recommended by the Committee, but when there was time they should be allowed to take up work on item (4). The Chairman said that items (*a*) and (*b*) of this heading could be taken up as to the extent of practical feeding trials, but for items

(c) and (d) he said a wholetime man would be required. Rao Bahadur Ananda Rao accepted the suggestion of the Chairman. The Report of the sub-committee was adopted.

29. *Application from the Government of Madras for a grant of Rs. 92,487 spread over three years for a scheme of research for improving the fishing industry and developing the supply of fish manure. (Subject No. 25 on the Agenda.) (Appendix XXIV.)*

The Chairman in introducing the scheme said that it had a very long history. At the last meeting of the Advisory Board it was turned down as the Madras Government had not complied with the condition laid down by the Governing Body. Since then they had done so and the Madras Government had undertaken to maintain their development work for at least three years. So the committee considered this scheme on its merits and recast it entirely (Appendix XXV). He explained the recommendations of the Committee and said that the total cost was reduced to Rs. 49,700 and that the Madras Government would be asked to contribute one-third of the expenditure in addition to making provision for a suitable chemical laboratory. Mr. Brodie pointed out an omission in the report and in line 30 on page 1 the words "not exceeding" were added after the word 'salary'. Mr. Jenkins enquired how this scheme could be considered to be of all-India importance and how it would be beneficial to agriculture. Dr. Sundara Raj explained that at present Madras was the only province where there was a regular Department of Fisheries and the work done by that Department would be beneficial to all the provinces in India as the usefulness of fish as an article of diet and manure was not limited to one province only. It was open to other maritime provinces to follow up the results of research conducted at Madras. He said that the development of fisheries would become an important problem when the question of nutrition was taken up. It was admitted at any rate in Madras by Statisticians that it was practically impossible to balance the diet of the ryots with cereals only. He said that a time would come sooner or later when this enormous wealth would have to be developed more seriously. Sir C. V. Raman supported the scheme and said that the Advisory Board should not be blind to the great value of the scheme. He said that India was the only country which did not know the value of the sea fisheries round the littoral. So far as the scheme was concerned, it was a modest one and it was proposed to saddle the Madras Government with a substantial share of the expenditure. He appealed to the Board to take courage in its hands and support the scheme.

Mr. Ware said that he supported the scheme in view of the importance of the scheme not only from the point of view of animal nutrition but also from the point of view of human nutrition, as Dr. Aykroyd had said that one thing which India wanted was a cheap supply of cod liver oil and he hoped that this particular point would be kept in view in working this scheme. Dr. Nazir Ahmed said that two major provinces were interested in this scheme, *viz.*, Madras and Bombay. In the Bombay Presidency they had been developing in recent years this side of fisheries and he therefore whole-heartedly supported the scheme.

Diwan Bahadur Raghaviah also supported the scheme in view of its all-India importance.

Colonel Olver explained that the Madras Fisheries Department had done a certain amount of work in this connection and had consequently a prior claim to a scheme of this nature to be financed by the Imperial Council of Agricultural Research. He also pointed out that the nutrition aspect of the scheme might lead to the further development of the scheme not only in Madras but also around the littoral in the country which would produce very valuable food material. He said the expenditure asked for in this scheme was a modest one. The Board unanimously adopted the report of the sub-committee (Appendix XXV).

30. *Report of the Tractor ploughing work conducted by the Burmah-Shell Company during 1935. (Item No. 16 of the Agenda.) (Appendix XXVI.)*

Dr. Shaw introduced the Report of the Sub-Committee (Appendix XXVII). Dr. Burns also commended the work done by the Burmah-Shell Co., in this direction.

It was proposed that the word 'idle' should be substituted for the words 'under repairs' in lines 3-4 of sub-paragraph 3 on page 1 of the Sub-Committee's report, and to add the word 'so' after the words 'were not' in line 7 on page 2. With these slight amendments, the Report of the Sub-Committee was recorded.

31. *Progress reports (not printed) of the dry farming research scheme 1933-36 in Hyderabad-Deccan. (Item 22 of the Agenda.)*

Dr. Shaw introduced the Dry Farming Schemes Co-ordination Committee's report (Appendix XXVIII).

Raja Jagan Nath Bakhsh Singh enquired if there were any other provinces in British India where dry farming schemes were in operation, and if so, their reports should be placed before the Board. The Chairman in reply said that dry farming schemes were in operation in Bombay, Madras, Punjab and Hyderabad and that the progress reports thereon would be discussed at the next meeting. The report of the Sub-Committee was accepted unanimously.

32. *First annual report of the dry farming scheme (Rohtak), Punjab, for 1935-36. [Item 22 (i) of the Agenda.]*

Dr. Shaw explained the recommendations of the Committee and moved the adoption of the report (Appendix XXVIII). This was carried unanimously.

The meeting adjourned at 5-45 P.M. to meet again at 10 A.M. on the 18th July 1936.

N. C. MEHTA,
Secretary.

SIMLA,

The 17th July 1936.

PROCEEDINGS OF THE MEETING OF THE ADVISORY BOARD, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, HELD AT SIMLA, ON THE 18TH JULY 1936.

The proceedings of the meeting commenced at 10 A.M. and the following were present :—

1. Sir BRYCE C. BURT, *Chairman*.
2. Mr. R. G. ALLAN.
3. Rao Bahadur D. ANANDA RAO.
4. Dr. B. K. BADAMI.
5. Mr. N. BRODIE.
6. Dr. W. BURNS.
7. Mr. F. CANNING.
8. Mr. P. H. CARPENTER.
9. Mr. N. CHATTERJI.
10. Sardar DATAR SINGH.
11. Dr. J. K. DUBEY.
12. Mr. H. L. DUTT.
13. Mr. T. J. EGAN.
14. Mr. E. S. FARBROTHER.
15. Khan Bahadur FATEH-UD-DIN.
16. Mr. M. R. FOTIDAR.
17. Mr. J. S. GAREWAL.
18. Dr. J. C. GHOSH.
19. Mr. S. GHOSE.
20. Dr. B. N. IYENGAR.
21. Raja JAGANNATH BAKSH SINGH.
22. Mr. W. J. JENKINS.
23. Mr. P. J. KERR.
24. Mr. J. C. McDOUGALL.
25. Mr. K. McLEAN.
26. Dr. S. K. MITRA.
27. Mr. A. M. MUSTAFA.
28. Dr. NAZIR AHMAD.
29. Mr. NIZAMUDDIN HYDER.
30. Colonel E. W. NOEL.
31. Colonel A. OLVER.
32. Mr. K. P. PILLAI.
33. Prof. P. K. PARIJA.

34. Mr. T. F. QUIRKE.
35. Diwan Bahadur T. RAGHAVIAH.
36. Sir C. V. RAMAN.
37. Major P. B. RILEY.
38. Mr. D. R. SETHI.
39. Dr. F. J. F. SHAW.
40. Mr. G. T. TAIT.
41. Rao Bahadur M. VAIDYANATHAN.
42. Mr. F. WARE.
43. Mr. V. L. WAZIR.
44. Sir MOHD. YAKUB.

Mr. N. C. MEHTA, I.C.S., *Secretary*.

Visitors—

Prof. A. C. AGGARWALA.
Rao Saheb D. V. BAL.
Dr. J. K. BASU.
Mr. E. J. BRUEN.
Mr. W. E. BUSHBY.
Rai Bahadur W. C. CHOPRA.
Mr. A. P. CLIFF.
Khan Sahib DOST MOHAMAD KHAN.
Mr. H. C. JAVARAYA.
Mr. B. S. KADAM.
Mr. N. V. KANITKAR.
Mr. D. N. KHURODY.
Mr. Z. R. KOTHAVALLA.
Dr. P. G. KRISHNA.
Mr. R. W. LITTLEWOOD.
Prof. P. C. MAHALANOBIS.
Mr. R. N. NAIK.
Mr. C. H. PARR.
Mr. H. B. RAJDEV.
Dr. L. A. RAMDAS.
Mr. RAMDHAN SINGH.
Mr. C. B. SAMUEL.
Mr. B. H. SCHNEIDER.
Mr. R. L. SETHI.
Mr. A. SUBBA RAO.

Mr. J. V. TAKALE.

Mr. C. VIJAYARAGHAVAN.

Mr. R. WATSON.

Mr. R. C. WOODFORD.

2. *Agricultural Marketing Progress Report.* (*Subject No. 26 of the Agenda.*) (*Appendix XXIX.*) *All-India Marketing Survey Reports.* (*Subject No. 27 of the Agenda.*) (*Appendix XXX.*)

Mr. Livingstone in explaining the recommendations of the Marketing Sub-Committee (Appendix XXXI) said that the two items under consideration were both progress reports relating to the work of the headquarters marketing staff. He pointed out that the recommendations of the Marketing Sub-Committee and the Advisory Board held in February 1936 had been put into effect. As desired by the Advisory Board at its last meeting he had met the Railway Agents with a view to facilitate the collection of relevant statistics. In regard to the Committee's recommendation that the Railway Board should be requested to advise the Agents to consider favourably any applications for extra statistics so long as the cost did not exceed, say, Rs. 500 per annum in each case. The Chairman said that he would mention the matter to the Chief Commissioner of Railways. The Report of the Committee on the above subjects was adopted.

A verbal change was made at the bottom of paragraph 3, *viz.*, for the words 'their agents' in line 11 of paragraph 3 on page 2 the words 'Agents of all Railways' were substituted.

3. *Annual reports for 1935-36 on Provincial Marketing Schemes.* (*Subject No. 28 of the Agenda.*) (*Appendices XXXII and XXXII-A.*)

The recommendations of the Committee (Appendix XXXI) were approved unanimously.

Diwan Bahadur Raghaviah suggested the addition of the word 'Provincial' after the words 'to draft' in line 2, paragraph 2 of the subject—this was accepted.

In regard to paragraph 2, the Chairman said that before passing on any provincial marketing survey reports to the provincial marketing boards, etc., for amplification and criticism the Provincial Marketing Officers should carefully see that such reports do not include any draft recommendations but might comprise a draft summary of the information collected. The premature release of draft proposals for action before the provincial information had been checked against the reports from other provinces and States and the centrally collected information might easily lead to misunderstandings and delays. In this connection, Dr. Burns wished to emphasise that there should be no action on the part of Provincial Marketing Boards on the marketing survey reports, without the approval of the Agricultural Marketing Adviser.

The Chairman thanked Dr. Burns for making this point clear. A consideration of the Provincial Survey Reports alone was liable to give

wrong and misleading results. It was often impossible to state the real position regarding a commodity until the central marketing staff had checked and compared provincial reports and embodied their own data.

With these remarks the report of the Committee was approved.

4. *Need for additional funds for the marketing schemes in the Provinces. (Subject No. 29 of the Agenda.) (Appendices XXXIII to XXXIII-H.)*

Mr. Livingstone explained the recommendations of the Committee.

In regard to paragraph 1 the Chairman said that this was merely a statement of the financial position. Now that some of the surveys were nearing completion, it was necessary that the Marketing Staffs should be able to show what practical results would follow from the work.

Referring to paragraph 2 the Chairman said that it was desirable to concentrate on getting out the final marketing reports on a few commodities and showing what practical action could be taken on these reports. The selection of the commodities on which reports were required to be submitted first was made on the basis of the extent to which enquiries were complete. In the case of wheat, linseed, tobacco, cattle, milk, and eggs nearly all the provincial and States reports had come in and work was going ahead with the preparation of the final reports. It was therefore recommended that attention should be concentrated on getting these reports out first, and investigation work on new surveys should be postponed, although it was extremely desirable that seasonal information should be collected by the local marketing staffs at particular seasons.

In regard to paragraph 3 the Chairman said he would permit the greatest amount of elasticity in respect of proposals from provinces for increase of staff provided the total allotment of funds to the Provinces concerned was not exceeded.

Paragraphs 1, 2 and 3 of the Committee's report were adopted.

Paragraphs 4, 5 and 6 were adopted without comment.

5. *Notes on the lines of future marketing developments. (Subject No. 35 of the Agenda.) (Appendix XXXIV.)*

Mr. Livingstone explained the recommendations of the Committee.

Paragraph 1 in the heading for "Grading and Marketing", the words "Grading and Marking" were substituted. The Chairman said that the recommendations of the Committee which were for the discussion by the Advisory Board were preliminary indications that had emerged from the examination by the Central Marketing Staff of the reports from the Provinces and Indian States.

Dr. Nazir Ahmed enquired if the proposals regarding the grading and marking of the commodities referred to had been circulated to the various Chambers of Commerce and their opinion invited. The Chairman replied that the tentative conclusions arrived at a Conference held by the Central Marketing Staff with the important grain trades associations in India had been conveyed to associations and considerable progress had been made in the direction of uniform 'futures' contracts for wheat. This would be a great step forward ; at present it was absolutely impossible (except

for people with an intimate knowledge of the trade) to compare the prices of wheat in markets like Amritsar, Lyallpur, Hapur and Karachi because in each individual case the percentage of refraction and dirt allowed differed considerably. At the Grain Conference a large amount of agreement had been secured in regard to 'futures' contracts for wheat. The idea was to get from the outset the co-operation of these trade associations and eventually it might be found desirable to set up one all-India association on several such federations of local associations and to give them statutory recognition.

In regard to packing and grading stations for fruits, eggs, butter, etc., Col. Noel enquired whether the Provinces could put forward proposals for funds out of the grant for 'Headquarters work on Grades Standards'.

In reply the Chairman said that the Agricultural Marketing Adviser to the Government of India himself would, in consultation with the provincial marketing staffs, select places where these experimental packing and grading stations could be located and consult them as to how the experiments could be put into operation. The provinces would not be invited to put up applications for special grants as the central allotment for these experiments was quite small, but if provincial Directors had any suggestions, *e.g.*, in regard to most suitable spots for the location of such stations, the Agricultural Marketing Adviser to the Government of India would be glad to receive such suggestions with reference to such commodities as fruits and eggs.

Mr. Livingstone explained the recommendations of the committee contained in the summary of proposed legislation, paragraph 3.

In regard to (*i*) Mr. Livingstone said that the trade associations with statutory recognition which it was proposed to set up would maintain grades and the trade would be done on the basis of those grades.

In dealing with proposal (*ii*) he said that it referred particularly to the packing and grading of products such as fruits, eggs and butter already referred to. It was most necessary to define what grades and marks a packer used.

The idea in proposal (*iii*) was that if any of the registered processors, packers, producers or manufacturers did not stick to the prescribed grades they would be removed from the list of registered producers, etc.

In reply to Dr. Burns, the Chairman said that the recommendations mentioned above would no doubt require legislation, and the question had to be examined in the light of the new Government of India Act as to how far the legislation would be Provincial and how far Central. This would take time but speaking generally the Chairman said that according to present indications, setting up of all-India standards for any particular commodity would have to be done by securing agreement of trade associations and the provincial governments concerned, and not by prescribing standards by central legislation.

Paragraph 3.—The Chairman pointed out that work on standards of wheat, sugar and hides had already begun. The work on the latter commodity was going shortly to be arranged in consultation with the tanners.

Paragraphs 2 and 4.—Registration of markets and slaughter houses.

Mr. Ware suggested that information in regard to slaughter houses should be obtained from Municipalities.

Diwan Bahadur Raghaviah suggested the addition of the word "local acts" after the word "municipal" in paragraph 4.

The Chairman said that there was no doubt whatever that local Governments and they alone had power to pass acts to regulate their primary markets and they had done so in some instances. In Madras a Marketing Act was in force which dealt with cotton, groundnut and tobacco. In Bombay there was the Cotton Markets Act In Berar and Central Provinces there were the orignial regulated markets which had been copied by other provinces. Information was not yet available why other provinces had not been able to adopt this system of regulated markets and why the Act had not been extended to other commodities. Information was needed on these points.

Dr. Burns pointed out that the real difficulty in the way of extending regulated markets was the resistance of vested interests and recently the Bombay Government had decided to establish three cotton markets in the teeth of opposition.

Mr. McDougall agreed with Dr. Burns' view and said that conditions were similar in the Central Provinces and these had prevented the extension of regulated markets to grain.

Mr. Nizamuddin Hyder said that the Agricultural Markets Act was being enforced in Hyderabad in a number of places. They had to encounter in the beginning opposition from vested interests but now the Act was working satisfactorily with the help of organisations consisting of officials and other trade interests.

Dr. Burns said that when one competition market was started others had to be started in the neighbourhood. The result of Dhulia and Amalner markets for instance had proved very advantageous.

The Chairman said one of the most important features of a regular market was that disputes were settled by the Committee on which purchasers, cotton-growers, etc., were represented—allowances and refraction charges were also regulated by the same Committee.

Dr. Burns was in favour of having the cotton and groundnut markets in the same compound and this was proposed at Dhulia. No legislation had yet been enacted in the case of other commodities, although there was a good case to do so.

In reply to an enquiry from the Chairman as to the conditions existing in Madras, Rao Bahadur Ananda Rao said that although a market was started in the beginning of April in Madras they still met with local difficulties.

Raja Jagannath Baksh Singh enquired whether uniform action from the centre could be enforced upon the various provinces.

The Chairman said that when complete information was obtained, it should be possible to supply the draft of an Act, draft bye-laws and general information showing how they would work with suggestions regarding bye-laws and how they had been worked elsewhere, as the Indian Central Cotton Committee had done in the case of cotton.

Raja Jagannath Baksh Singh enquired what was to be done in the case of provinces which had no Market Acts. The Chairman said that the course of action would be decided on receipt of the survey reports.

Khan Bahadur Fateh-ud-Din said that in the Punjab all commodities were brought to the general market and there were no separate markets for special commodities.

Mr. Jenkins said that any successful method of improvement must contain practical suggestions as to how to get over the difficulties of financing the cultivator.

The Chairman said that this would also be taken up in the reports.

Mr. Nizamuddin Hyder said that to deal with this difficulty co-operative sale societies had been tried in Hyderabad.

The Chairman said that that was one method of dealing with the question.

Col. Noel said that their efforts to organise co-operative grain marketing in the North West Frontier Province had failed as soon as departmental supervision was withdrawn. In the first year they secured a premium of 4 annas per maund on wheat. The North West Frontier Province zamindars would always mix dirt with their wheat as long as they could sell it.

The Chairman said that the cause appeared to have been that official supervision was probably withdrawn prematurely. Raja Jagannath Baksh Singh said that nobody could teach the cultivator not to mix dirt in his grain so long as premium was not paid for quality. Improvement in the quality of the grain depended on the improvement of marketing.

Mr. MacDougall agreed with Col. Noel and said that in the Central Provinces they have been running a marketing scheme for the past 6 years with the help of the Indian Central Cotton Committee. Under this scheme the cultivator got full value for his cotton. It was hoped that this example set in marketing cotton departmentally would be taken up by the Agricultural Associations who had so far done very little in this direction outside the pool controlled by the Department.

Mr. Livingstone pointed out that the Gowala Association for the supply of milk in Nagpur had proved successful.

Mr. Allan said that this was an example of an Association that had been nursed until it had found its feet.

Sardar Datar Singh said that he produced 10,000 maunds of wheat and 8,000 maunds of cotton by *batai* system and distributing improved seed got premium of 0-2-0 to 0-3-0 per maund. It was not quite right to say that improved quality would not fetch a better price.

In reply to an enquiry from Raja Jagannath Baksh Singh, Sardar Datar Singh said he was talking only of the Punjab. Khan Bahadur Fateh-ud-Din pointed out that Sardar Datar Singh's example did not apply to small *zamindars*. Dr. Burns pointed out that in order to carry out this work successfully, much depended on the type of the individual who should have public spirit and business ability.

The Chairman said that when co-operative sale societies had been started in various parts insufficient attention had been given to the necessity of securing a proper business manager.

The sub-committee's report was then adopted.

6. *New I. D. D. course for Provincial Agricultural and Veterinary Colleges. Report of the Special Committee. (Subject No. 15 on the Agenda.) (Appendix XXXVI.)*

Colonel Olver introduced the report of the Special Committee (Appendix XXXVI). The Chairman said that the Government of India had decided that after a term of years the Bangalore Dairy Institute should only give higher instruction in dairy technology. This was an attempt to find out how the new course could be fitted in in the curriculum of the existing colleges. The proposal was to divide the I. D. D. course into two parts—Part I would be provided by the provinces and Part II by the Government of India.

Sir C. V. Raman suggested that the word 'Institute' might be reserved for organisations costing more than Rs. 5 lakhs per annum and that the word 'Laboratory' might be used for smaller organisations, as the use of the word 'Institute' was likely to cause a certain amount of confusion. The Chairman said that this was a matter for the Government of India to decide and that the Imperial Dairy Institute at Bangalore was an institution with an honourable history.

The Chairman then took up the consideration of each recommendation of the Special Committee.

Recommendations (1) to (3) were approved by the Board.

Recommendation (4) was amended by the Board as follows :—

> "(4) There must be one common examining body for the Part I examination and a common entrance examination which will be competitive before students were admitted to the Part II course at Bangalore, but that the claims of all provinces to the facilities of the Institute should be recognised."

Recommendation (5) of the Special Committee was approved by the Board.

As regards the recommendation of the Special Committee regarding recognition of institutions for training students in Part I on page 3 of the Committee's Report, Mr. Jenkins said that at present Sind had no agricultural or veterinary college to train students and that no provision now existed for the provincial training of Sind students in agriculture, as Sind had been separated from Bombay. In regard to the admission of Sind students, for instance, to the Lyallpur Agricultural College, students were asked to contribute Rs. 800 each towards the maintenance of the college. He was therefore of the opinion that the Central Government

should continue to provide training in both these Parts. The Chairman explained the position that under the Government of India Act the Central Government was concerned with advanced and specialised instruction. The Government of India had informed Local Governments that after five years, it would cease to provide elementary instruction in dairying but would maintain an institute for advanced training in dairy technology. He further remarked that the facilities offered to Sind students at Lyallpur was much cheaper than starting a new agricultural college in Sind.

Dr. Burns enquired about the existing capacity of the Institute at Bangalore. The Chairman replied that at present the hostel accommodation was for 15 students and that it could probably be increased to 25 without much difficulty. Dr. Burns was of the opinion that the accommodation was rather small. He also pointed out that most, if not all, of the agricultural colleges were affiliated to one University or the other and before any changes in the curriculum were made they would have to refer to the University concerned. Dr. Burns, Sir C. V. Raman, Mr. Kerr, Mr. Jenkins and Major Riley were of the opinion that provision should be made for the admission of students to the entrance examination who had not had any training of Part I in a recognised institution. Mr. Allan held the contrary view and said that a person should possess a definite standard of training before he came up for the Part II course.

Mr. Kothavala said that the following two conditions were required to be satisfied before a student was allowed to sit for the N. D. D. examination in Great Britain :—

(1) The student should have spent at least six months in a recognised farm, and

(2) he should have at least put in four terms in a recognised agricultural or dairy institute.

After further discussion the Chairman suggested the following amendment to the first paragraph on page 3 of the Special Committee's report :—

"Strike out all the words after the word 'Governments' in line 3 of the paragraph and add the following as a new sentence :

'All candidates appearing for the entrance examination for entering the Dairy Institute will be required to produce satisfactory evidence of practical training in dairy science'."

The amendment was accepted by the Board.

The first seven recommendations relating to the main heads of instruction were approved by the Advisory Board.

As regards item (8), Sardar Datar Singh pointed out an omission. In India milk supply to hill stations was an important consideration in commercial dairying. The Sub-Committee wanted to make it clear that the Bangalore Institute would include the dairy farm at Wellington. The Chairman confirmed this and the point was noted. The recommendation of the Committee was adopted.

The next recommendation considered was the personnel of the Board of Examiners on page 5 of the report.

Mr. P. H. Carpenter said that the words ' on completion of part I ' in line 10 on page 5 should be deleted in view of the amendment to paragraph 1 on page 3. This suggestion was accepted by the Board.

In the list of examiners for Part I Dr. Shaw moved the following amendment :—

" Add as No. 5. An Agriculturist ".

He explained that by the term ' Agriculturist ' he meant either a Deputy Director of Agriculture or a Professor of Agriculture at any of the Agricultural Colleges. Mr. Sethi seconded Dr. Shaw. Mr. Ware said that the term ' Dairy Husbandman ' was sufficiently comprehensive and that he would also be conversant with the growing of fodder crops. The Chairman put the amendment to vote which was carried—17 for and 16 against.

The Board approved the *personnel* of examiners for Part II and also of the appointment of the Sub-Committee to draft the detailed syllabus.

The Advisory Board adopted the report of the special committee as amended.

7. *Application from the Government of Sind for a grant for sub-surface investigation work carried out in the Lloyd Barrage area in Sind. [Item 14 (i) on the Agenda.] (Appendix XXXVII.)*

Dr. Shaw introduced the recommendations of the Soil Science Committee (Appendix XXXVIII), and observed that it was important that chemical observations on the soil should be included in the scheme. Mr. Bushby, Executive Engineer, Research Division, Irrigation Department in Sind, suggested that the wording of the first sentence of this resolution should read as " The Committee recommended that Rao Bahadur Viswanath and Dr. Basu should visit Sind and work out a scheme of soil investigation in collaboration with the Executive Engineer, Research Division, Sind, Mr. Bushby and Rao Bahadur Tamhane, Agricultural Chemist, Sind ". Mr. Jenkins accepted this. Mr. Carpenter suggested the addition of Professor J. N. Mukherjee in view of special study of colloid chemistry. Professor Mukherjee said that unless the meetings were held in vacation time, *i.e.*, in October and November, he would not be able to attend. The Chairman suggested that Dr. Mukherjee might be made a corresponding member of the proposed committee. The Board approved of the suggestion of the Chairman.

8. *Progress report (not printed) on the scheme for the study of soil problems by the Physical Assistant appointed on the staff of the Agricultural Chemist, Bengal, for 1934-35. [Subject No. 14 (iii) on the Agenda.]*

Dr. Shaw moved the adoption of the Committee's report (Appendix XXXVIII). Dr. Nazir Ahmad suggested, with reference to the last sentence of paragraph 3 under this subject, that the units of measurements in all the tables should be specified more carefully. The report of the Committee was adopted.

9. *Annual report (not printed) of the sugarcane research scheme, Bombay-Deccan, Padegaon, 1934-35.* [*Subject No. 8A (ii) on the Agenda.*]

Dr. Shaw explained the suggestions of the Committee and commended the report (Appendix XXXVIII) to the Board. Mr. Allan said that in view of the excellent and outstanding work of all-India importance done at the station, if it was not possible for the Bombay Government to provide 50 per cent. of the cost of the scheme, the Council should provide full funds for it, so far as it pertained to the work on soil science, the balance of the cost for 3 years being based on the 50 : 50 basis. The cost of the work on soils spread over 3 years would be Rs. 57,000, the contribution as payable by the Government of Bombay will thus be approximately one lakh as against their offer of Rs. 75,000 for 3 years or an addition of Rs. 7,000 per annum to their budget. Dr. Burns said that he welcomed the suggestion in the event of need arising. The Chairman said that he did not quite like the idea of splitting up the scheme into two portions. Mr. Carpenter enquired whether the cost of scheme would not be met from the grant made by the Government of India for sugar research. The Chairman replied that there was no special purse for sugar research. There was no important sugar scheme awaiting allotment of funds apart from the renewals now recommended. Mr. Allan's suggestion and Dr. Burns comments on it were recorded, and the report of the Committee was then adopted.

10. *Cattle Improvement scheme initiated by His Excellency the Viceroy.* (*Subject No. 30 on the Agenda.*) (*Appendix XXXIX.*)

Col. Olver in introducing the report of the Standing Cattle Breeding Committee (Appendix XL) said that he had gone to some length in the proceedings because he thought it desirable to record the views of the members and representatives of different provinces as to how the scheme could best be implemented. After discussion the Committee had recommended 7 points for the consideration of the Board.

(1) Mr. Jenkins said that this recommendation was to be made to the Provinces. In Sind they had two very important breeds, *i.e.*, Sindhi and Tharparkar. These breeds were spread all over India and it would not be possible for the Sind Government to carry out all the pedigree breeding required for these two very important breeds. This work should not fall only on Sind. He asked if Sind could be provided with funds from the Council for the improvement of these two breeds in view of the extensive demand for these all over India. Col. Olver said that it was necessary to encourage and improve breeds in their natural breeding areas and in fact an officer had already been appointed by the Government of India to give assistance to Sind in regard to the Tharparkar breed. He however pointed out that it was to the interest of Sind itself to encourage breeding of their local breeds. The Council was taking up the question of registration of pedigree stock with the object of encouraging their sale to other parts of India and to other parts of the world. Col. Olver added that cattle breeding was purely a provincial subject and the Imperial Council of Agricultural Research could not be expected to undertake to provide funds for this purpose.

The recommendation of the Committee was adopted.

(2) In explaining the Committee's point, Col. Olver said that His Excellency had presented a bull to the Delhi Pinjrapole, because there were great opportunities for doing something for cattle improvement provided that *pinjrapoles* and *gowshalas* were run under suitable control as was being done in various places, *e.g.*, Bombay and Delhi. He added that systematic work should be done in all such institutions on the lines proposed in the case of the Delhi Pinjrapole to carry on pedigree breeding, *viz.*, registration of stock, strict recording of milk yields and production of butter and milk under satisfactory conditions, while land should be obtained outside the cities where old and derelict cattle could be cheaply maintained and fodder crops produced for the dairy herd. The recommendation of the Committee was adopted.

(3) In explaining the recommendation of the Committee, Col. Olver said that all members of the Committee agree that a fund was likely to be of more use than the mere donation of bulls. It was often difficult to find suitable bulls and these would in any case have to be selected by the Provincial Departments responsible for cattle breeding. It would be much better to have a fund which would be drawn upon for the purchase of bulls, or their maintenance. The recommendation of the Committee was adopted.

(4) This was unanimously agreed upon.

(5) Col. Olver explained that the intention was that castration should be done under suitable supervision.

Mr. Ware said that in certain Provinces the local Governments were employing quacks to carry out castration work, and suggested that the Advisory Board should deprecate any such retrograde step. He suggested that his point would be met if the words 'under veterinary supervision' were added at the end of paragraph 5. Mr. Ware added that quacks were being employed to do this work perhaps under the belief that castration was not being carried out in these Provinces as fast as people would desire and proceeding hand in hand with the issue of stud bulls. He suggested that the Council should recommend to local Governments that castration should be done only under veterinary supervision.

The Chairman said that it would not be right to make so far-reaching a recommendation in a matter affecting provincial organisation at short notice. It did not really arise out of the main subject under discussion. He did not approve of Mr. Ware's suggestion. The subject could be discussed in the Board as a separate subject after due notice. It could not be discussed adequately under this heading immediately, however, important the point might be.

Several speakers emphasised the need for proper supervision and control of castration.

The addition of the word "proper" after "that" in line 1 of page 5 was approved. The recommendation of the Committee was adopted as amended.

(6) Col. Olver said that vaccination should be given free to induce cattle owners to get their cattle registered and it would have the advantage that it would give the permanent protection against rinderpest and a

registered stock. It was agreed after discussion that for every 50 bulls there should be one suitably qualified inspector and some subordinate staff. This recommendation was adopted.

Col. Olver explained that he had asked the opinion of the Committee as to how far official recording of pedigree stock could be proceeded with. All Provinces seemed unanimous that it was necessary to form cattle breeding societies which would be under official control and he felt that a start might be made with official recording in conjunction with these societies He said that it was most important to make a start with milk recording which everyone agreed was essential in order to carry out improvement of dairy cattle and he desired the views of the representatives of Provinces as to how far that would be feasible.

The Chairman observed that the object was to see how we could devise means for securing continuity in this great effort which His Excellency had inaugurated. In the matter of cattle improvement, continuity and sustained effort were most essential.

Sir Mohd. Yakub asked why the District Boards should not look after the work. The Chairman said that there was no proposal to start new veterinary departments, but if any good results were to be achieved, proper registration of pedigree stock was necessary which could not be done without inspectors and stockmen, who would also maintain the history of the progeny.

Mr. Bruen said that it was not merely the question of castration but also of registration of pedigree stock for which additional staff was essential.

Raja Jagan Nath Baksh Singh enquired as to the number of centres where it was proposed to start this kind of work.

Colonel Olver replied that the intention was to start work in the very best centres for each breed and to try to establish pure stock in that particular centre. As more funds become available the work could be extended into other areas but it depended very much on the results in the Provinces.

The Raja Sahib asked whether there would be half a dozen centres in each province for the purpose.

Colonel Olver replied that this was a matter for each Province to consider.

In reply to Colonel Noel, Colonel Olver said that it would have to be left to Provinces and states to decide to what extent they considered work on milk breeds and on working cattle necessary. There were definite areas in which dairy farming and the breeding of dairy cattle could flourish and there were others in which it was much more profitable to produce working cattle.

Mr. Quirke asked whether any attention would be paid to buffaloes which were the best milk producers. The Chairman replied that buffalo was not included in the present scheme, and suggested that the question of buffalo improvement might be left over till the Dairy Scientist had reported.

Mr. Quirke suggested that it might be left to the discretion of the Provinces to utilise the funds collected in connection with the Viceroy's scheme towards buffalo improvement as well as cow improvement. The Chairman said that it was His Excellency's wish to do something for the village cow which produced milk and working bullocks. Buffalo breeding was really a special question. In reply to an enquiry from Raja Jagannath Baksh Singh as to the funds available, the Chairman said that this depended on the response to the Viceroy's appeal and no estimate of expenditure had yet been made as the details varied in different provinces.

Mr. Jenkins said that the financial position of Sind was not strong as it had only recently been constituted a separate province. It provided the Sindhi and Tharparkar breeds for all parts of India and for doing this particular kind of work, Sind should have a claim on the funds of the Government of India.

The Chairman pointed out that here is a demand from other provinces for Sind male and female-stock, which is definitely profitable to the cattle-breeders of Sind. The best line for Sind to take would be to concentrate their limited funds on providing pedigree sires for their best breeding areas. He considered that Sind was in a very fortunate position. From the Sindhi herds maintained in other parts of India some first class pedigree sires might be obtainable for Sind. That was why registration of Sindhi cattle was going to be started.

On the suggestion of Mr. Wazir, the Board agreed to add the words "and states" after provinces in line 12, page 4, of the Committee's Report.

The report of the sub-committee as amended was adopted unanimously.

11. *Application from the Government of Travancore for a grant of Rs. 2,89,136 spread over ten years for a scheme for improving the cattle in the west coast of India. (Subject No. 6 on the Agenda.) (Appendix XLI.)*

Col. Olver explained the recommendations of the sub-committee.

Mr. Pillai (Director of Agriculture, Travancore) pointed out that the decisions arrived at in the sub-committee were not exactly the same as were given in the report. So far as he remembered, most of the members said that the scheme would be of great use to the whole of the West Coast.

It was stated in the report that it was only a repetition of what had already been done elsewhere. No organised effort had been made on an intensive or extensive scale to grade up the cattle of West Coast which suited the conditions of that tract of India. He did not agree with the sub-committee's observation. Cattle of the West Coast were very poor in regard to milk yield as well as for other purposes and something was required to be done to improve the economic condition of the rural population on the West Coast. To get tangible results it was necessary to do breeding work there and to maintain a register for a sufficiently long period so that the results obtained could be made use of in other parts of India.

The Chairman said that the Board fully appreciated Mr. Pillai's enthusiasm and fully understood his scheme. It was a cattle-breeding and cattle development scheme but not a research scheme. It was not possible for the Board to sanction the scheme as it stood. He suggested that the best way of getting funds would be to start a " Bull Fund " on the lines of His Excellency the Viceroy's scheme and to get the wealthier people of Travancore to subscribe to it. Colonel Olver would be only too pleased to help Mr. Pillai with advice.

Mr. Pillai pointed out that this suggestion was different from the scheme.

Diwan Bahadur Raghaviah said that the Travancore Government might be suggested to put up a research scheme.

The Chairman suggested that the Travancore Government be invited to send up a research scheme. As regards the cattle development scheme, they might be invited to carry out the recommendations of the Board on Subject 30. The report of the Committee was adopted unanimously.

12. *Application from the Government of the Punjab for a grant of Rs. 15,000 for sending an officer of the Punjab Veterinary Service, Class 1 on deputation to South Africa to study the Angora Goat Breeding Industry. (Item 5 on the Agenda.) (Appendix XLII.)*

Colonel Olver explained the recommendations of the sub-committee. It was agreed in the Committee that the scheme should be supported provided the Provinces, likely to benefit by it (North West Frontier Province, Punjab, Kashmir and the United Provinces) would agree to contribute half the total cost, the other half being met by the Imperial Council of Agricultural Research.

Mr. Fotidar said that he was not sure whether the Kashmir Government would agree to contribute to the scheme as they had their own special problem.

Mr. Egan said that his province was interested in the scheme but he was not sure whether his Government would agree to contribute towards the scheme.

Mr. Allan enquired whether the Angora goat breeding industry was worth considering at all and remarked that it was not likely to be a profitable industry.

Colonel Olver said that though Angora goat breeding industry was passing through a depression at the present time it was not likely to remain so for ever.

In reply to an enquiry from Mr. Bruen, Mr. Livingstone said that under the marketing survey they had only got to a stage of preparing a synopsis of wool figures.

Mr. Samuel said that the merchants whom he had met, did not agree that it would be profitable to cross the South African goat with the Kashmir goat.

Mr. Ware said that it was not a question of increasing the size but it would improve the tastiness of the meat.

The sub-committee's report was adopted.

13. *Annual report for 1935-36 (fifth year) on Mr. Slater's scheme for the improvement of goats in the United Provinces. [Item 9 (v) on the Agenda.] (Appendix IX.)*

Colonel Olver explained the recommendations of the sub-committee which were adopted.

14. *Proceedings of the First meeting of the Wheat Committee. (Subject No. 13 on the Agenda.) (Appendix XLIII.)*

Dr. Shaw introduced the subject and summarised the recommendations of the Committee including that of the Scientific Research Sub-committee. The report of the Wheat Committee (not printed) was put before the Board and passed unanimously.

The recommendations of the Wheat Committee in respect of items Nos. 8 (c), 10, 13 and 14 were approved by the Board.

As regards item (11), the Chairman said that the idea was to broadcast from Delhi weekly reports of prices and market conditions and to relay them to Calcutta and Bombay. Colonel Noel said that in the North-West Frontier Province they were broadcasting daily prices of wheat which was appreciated by the merchants and villagers. He said that those interested in wheat marketing would welcome information about Karachi prices and other world conditions.

Dr. Shaw introduced the report of the research sub-committee of the Wheat Committee.

Registration of wheat varieties. (Item 4 on the Agenda of the Wheat Committee.) Dr. Shaw explained the recommendations which were adopted by the Board.

Wheat breeding for the black-soil. (Subject No. 6 on the Agenda of the Wheat Committee.)

Dr. Shaw explained the recommendation of the sub-committee and said that the Wheat Committee approved of the proposal which would be considered in relation to there possibly being a better site available on the black cotton soil. Mr. Nizamuddin Hyder mentioned a mistake in the draft proceedings of the Wheat Committee which he wanted to correct. The Chairman asked him to send in his correction. The recommendation of the Wheat Committee was accepted.

Proposal for a Technical Institute for investigations of cereals. (Subject No. 7 on the Agenda of the Wheat Committee.)

Dr. Shaw explained the recommendation of the sub-committee and said that the investigation on wheat products such as 'Force', shredded wheat, etc., was omitted, as the importation of these articles was very small. The report of the sub-committee was adopted.

Proposal for Extension of rust resistance testing work on wheats. (Item 9 on the Agenda of the Wheat Committee.)

Dr. Shaw explained the recommendation of the sub-committee and said that the work would be better carried out at a central station, but that facilities would be available in the Research Laboratory of Dr. K. C. Mehta for the testing of the wheats bred in the Punjab. The Chairman

said that it was important to breed rust-resistant wheat suitable for the Simla hill tracts and the adjoining country to the east as Dr. K. C. Mehta attached great importance to these areas in regard to the carry over.

The recommendation of the sub-committee was approved.

Rust Research in Bombay (Deccan).—Dr. Shaw in explaining the recommendation of the Committee said that after some discussion the Wheat Committee approved of the following resolution :—

> "The Wheat Committee recommends that a sub-station of the Rust-Research Station at Simla should be located at the most suitable site in Peninsular India, and that the Provinces and States concerned should be requested to examine the question and make recommendations upon the location of the station."

Dr. Shaw said that if a suitable station was not found in the Bombay Presidency, the sub-station to the Simla Station might be located in the Nilgiris.

Dr. Burns said that in the Bombay Presidency they had been working on the breeding of *Durrum* wheat for the past several years and what they were not able to do was the testing of hybrids for rust resistance. They had sent up this proposal in response to the circular letter from the Imperial Council of Agricultural Research asking for subjects for the consideration of the Wheat Committee. He said that he had recommended to the Bombay Government certain items of research, namely :—(1) stopping of soil erosion, (2) green manuring, (3) mechanical cultivation ; which should be taken up by the Local Government itself, but as regards the testing of wheat varieties against physiological forms of black rust, he sent it up to the Imperial Council of Agricultural Research as it was of all-India importance. He said that Dr. Uppal had sent up a scheme to the Council two or three years ago on this particular problem but the Council did not approve of it. As only a limited amount of money was set apart in the Bombay Presidency for agricultural research, they were not in a position to carry out this work within the allotted amount. They were experiencing great difficulty in breeding rust resistant varieties of *Durram* wheats as they could not test them against physiological forms of rusts without a glass house. He said that Poona was ideally situated for establishing a sub-station for the Simla Station for the following reasons :—

1. A glass house for finding soil temperature in connection with virus diseases of plants was to be added.
2. They have been doing this kind of work for a long time. The temperature in Poona did not go beyond 102 to 106° and this temperature was only for a few days. The variation in temperature was not beyond 10 to 20°.
3. Dr. Uppal, the Mycologist to the Bombay Government who was well versed in rust research work, was willing to supervise the work.

He said that it would be worth while considering the location of the sub-station in Poona.

The Chairman said that the main doubt in the minds of the Committee was whether it would be possible to maintain the rust cultures throughout the year as it would be impossible to supply fresh cultures every year from

the Simla Station. Mr. Kadam supplemented the information given by Dr. Burns and said that such a contingency as the destruction of all the cultures and a re-supply from the Simla Station would never arise. They would probably require only cultures of one or two forms. The Chairman said that when the detailed proposal comes up from Bombay, the Advisory Board would need a definite assurance that they could maintain wheat rusts all the year round at the Bombay-Deccan station and that the scientists should satisfy themselves on this point.

The recommendation of the sub-committee was approved in the end.

Need for experiments to determine the natural moisture content of wheat at different centres in the country in different seasons. (*Subject No. 17 on the Agenda of the Wheat Committee.*)

Dr. Shaw introduced the report of the sub-committee. Dr. Nazir Ahmed said that systematic work should be done at one centre to investigate the variations in the moisture content in relation to varying temperature and humidity. This work should extend not only to different varieties but also to a variety of different seasons. This would do away with the necessity of repeating the experiments.

The Chairman agreed with the suggestion of Dr. Nazir Ahmed.

The report of the sub-committee was approved.

Need for cheap and efficient "threshing" and "winnowing" machines. (*Subject No. 12 on the Agenda of the Wheat Committee.*)

The Board approved of the recommendation of the Committee on this subject as well as the recommendation in regard to the commendation of the plan adopted in Muzaffarnagar to store grains in cement concrete *Khattis* to Local Governments and commercial bodies was approved.

15. *Village enquiry regarding cattle and the production and consumption of milk.* (*Subject No. 4 on the Agenda.*) (*Appendix XLIV.*)

Col. Olver in introducing the subject said that the scheme was drawn up at the instance of His Excellency the Viceroy and approval had already been given by the Cattle Breeding Committee. He asked the members of the Board to consider it with a view to making improvements.

He drew attention to the various points mentioned in the report of the Cattle Breeding Committee. The Chairman said that the Committee had made a few practical alterations in the questionnaire and they were now before the Board for acceptance.

Raja Jagannath Baksh Singh said that he did not agree with the recommendation of the Committee in so far as it narrowed down the scope of the enquiry. He said that the position of the agriculturist from the economic point of view has always been of some importance in this country, which has considerably enhanced since he has received political powers, that any enquiry that may be made as regards his condition should be thoroughly gone into and should be as reliable as possible. In the original scheme it was proposed to investigate at least 50 villages, but the Committee had since reduced the number to about 30 villages, and that of the holding from 20 to 10. He was of the opinion that an investigator could easily pick up ten good holdings in a village and report on them. The

information thus secured would not be reliable, for, from the idea that he has got of his own province (United Provinces of Agra and Oudh), he could say that the average number of holdings in a village may be somewhere about two hundred. He suggested a reconsideration of the recommendation of the Committee.

The Chairman said that in the original scheme 5 per cent. sampling was adopted as recommended in the Bombay Robertson Report, but certain members of the Committee who had practical experience of such surveys were of the opinion that the investigators could not finish their work within three months.

Mr. Aggarwala said that he had also experience in carrying out milk surveys and was of the opinion that work as originally drawn up could be carried out in three months. Dr. Nazir Ahmed supported Raja Jagannath Baksh Singh and said such an enquiry should be thorough and accurate. If the number of holdings was reduced, there was the risk that the holdings selected may be either well above or well below the average. Furthermore, he emphasized the necessity of employing the randomisation method to the holdings as in the case of villages. If the adoption of these suggestions meant some extra expenditure, it should not be withheld owing to the importance of this enquiry. After several speakers had taken part in the discussion the following agreed formula was approved by the Board :—

That instead of thirty villages in three months the investigation should be conducted in 50 villages in five months.

The opinion of the Board was that this would ensure the obtaining of more accurate information.

Number of holdings.—The Chairman said that in this case a certain amount of latitude might have to be allowed to Provinces ; and 5 per cent. sampling in the number of holdings per village selected at random might answer the purpose.

Diwan Bahadur Raghaviah suggested that only those holdings where there were cattle, milch cows and oxen, should be included in the selection and others excluded. The Chairman said that this would be made a rule that if it was found that any particular holding or holdings on list had no cows, the next on the list would be taken up. With this modification the proposal was carried. Raja Jagannath Baksh Singh suggested that the questionnaire prepared by the village Investigator should be verified by the farmer concerned, because the questionnaire was proposed and accordingly named to be " Questionnaire for each farmer ". It should also be verified by the village *patwari* for the Investigators would have to fall back upon the records of the *patwaris* to a considerable extent, particularly regarding the area, crops and irrigation figures.

The Chairman said that the Raja Sahib's suggestion would be kept in mind.

Mr. Livingstone said that during the course of the enquiry evidence should be produced as to what was the quantity of milk drawn and what was left over for the calf. Mr. McDougall suggested that to the total yield of milk drawn from a cow, 1/8 of it could be added which was to be counted as the calf's supply.

Mr. Allan enquired why a most important area, *viz.*, the area in the neighbourhood of Anand where there was large concentration of milch cattle had been left from the areas selected for the investigation. There were large numbers of buffaloes in that area. The Chairman said that he appreciated the importance of buffaloes but it was not intended to include these in the enquiry. The investigation was intended to apply to cows which produce a certain amount of milk and also working cattle. It was not an enquiry into the dairy industry or with the milk supply question on an all-India basis.

Mr. McDougall thought that the areas laid down in the Council's letter to Provinces were merely by way of suggestions, and that it would be left to the Provinces to choose appropriate areas.

The Chairman in explaining the position said that the original idea was to try and get an economic background for breeding policy in those areas which were breeding working cattle and also were producing a certain amount of milk for their own use. It was to a very great extent an investigation of the milk supply in the villages possessing ordinary general purpose (working and milch) cattle. Some of the most famous purely working cattle producing areas had been excluded. It was a preliminary attempt to find out what was happening in villages.

Mr. Shah suggested that a hill area, *e.g.*, Hazara District, might also be included in the enquiry where the villagers possessed both working as well as milch cattle.

Col. Olver said that it was not possible to accept the suggestion. The intention was merely to take a sample of 7 reasonably typical areas in which cattle were bred in the villages to find out how much milk the villagers produce, how much they consume and how much they have spare for sale. The inclusion of hilly tracts was not feasible at present.

After discussion it was decided not to include any more areas for the present. It was possible that the enquiry might have to be continued, after experience had been gained.

Mr. McDougall enquired as to when the investigation was expected to be started. The Chairman asked the Provincial Directors of Agriculture and Veterinary Services as to when they would be able to send up their supervisors for instruction.

Central Provinces, Punjab, United Provinces, could send up their supervisors by the 1st of August. Bombay was not sure. Madras could also send up by 15th of August. After discussion it was decided that all Provinces should send up their supervisors for instruction by the 15th of August and the investigation would start by the 1st of September.

16. *Application from Bt.-Col. R. N. Chopra, School of Tropical Medicine, Calcutta, for an additional grant of Rs. 13,200 spread over three years to expedite work in connection with the study of medicinal plants and food poisons in India. (Subject No. 32 on the Agenda.) (Appendix XLV.)*

The subject was postponed till the next meeting of the Advisory Board in view of the telegram from the Bengal Government.

17. *Application from the Government of Madras for a subsidy of Rs. 63,900 spread over three years to the Kerala Soap Institute, Calicut. (Subject No. 33 on the Agenda.) (Appendix XLVI.)*

The Chairman in explaining the position said that the reason why this application had come up to the Council for allotment of funds was that about three years ago, the Council had set up a sub-committee called the Oil-Crushing Industry Committee which discussed the question of promotion of the oil-crushing industry. The Oil Technologist of the Kerala Soap Institute, Calicut was also a member of that Committee. The Committee was discussing at that time the question of having a cess on oilseeds which might go towards improvement of oil-crushing industry. Since then the Advisory Board, at its last meeting, recommended that the grant to the Oil-Section of the Harcourt Butler Technological Institute be continued by one more year only in order to avoid any gap. The Governing Body of the Council had approved of that decision, so that the position from March 1937 was that the Council would not be spending money on oil technology. Mr. Brodie said that the Industrial Research Council was not analogous to the Imperial Research Council. It had no grant from which it could sanction the undertaking of researches. The Government of India had recently issued orders on the subject of proposals for research from which it was clear that if any proposal was to be made for research to be financed from central funds, the prior sanction of the Government of India was necessary. If, therefore, the Madras Government wished to put up this scheme, they could not place it directly before the Research Council but must first submit it to the Government of India. If the Government of India considered that it was worth while, it might be willing to provide funds for it and in that case it would place it for opinion before the Industrial Research Council. The scheme as it stood did not in his opinion come within the province of the Imperial Council of Agricultural Research in accordance with the demarcation of functions agreed on between the two Departments. With one exception, every item mentioned was something that the Industrial Council had already in hand. The exception was a project for research on fish oil, guano and fish meal. A separate scheme for dealing with these very items had however been sanctioned the day before yesterday for another Department of the same Government.

Rao Bahadur Ananda Rao said that the Director of Industries had told him that the point with regard to fish manure was only illustrative. Mr. Brodie continuing said that if this item was ignored the remaining items would be entirely those that the Industrial Research Council had taken up, such as paints, varnishes, lubricating oils and so forth.

The Chairman said that in view of Mr. Brodie's remarks he did not think that the scheme required consideration by the Board as it covered a field for which the Industrial Research Council had assumed responsibility. The Board would advise the Madras Government to address the Industries and Labour Department of the Government of India.

The Board agreed.

18. ***Proposals for the continuance of the Animal Husbandry Bureau as a quasi-permanent section of the Imperial Council of Agricultural Research. (Item 34 on the Agenda.) (Appendix XLVII.)***

Col. Olver introduced the scheme and said that a nucleus for an All-India Bureau of Animal Husbandry was started in 1934. It was found absolutely essential to get information on which to base the Imperial Council of Agricultural Research schemes. It had done a good deal of work. It was now proposed to take over further responsibilities for which it was essential to have more staff. The expenditure was quite modest. The Chairman said that, before the scheme was sent to the Governing Body, the Government of India would be consulted regarding the actual salaries to be paid ; that was a convention which had been established. He had no doubt that the Bureau was doing good work. The extension of the scheme was approved.

19. *Recommendation of the Crop Planning Conference, June 1934, regarding the extension of sugarcane cultivation in India.* [*Item 8-B (iv) on the Agenda.*] (*Appendix VI-B.*)

The Chairman said that this subject was considered by the Sugar Committee at its last meeting and they came to the conclusion that all local Governments should be asked to consider whether it was wise to actively increase the area under sugarcane or whether they should concentrate on improving the quality of the crop. The reason for this recommendation was that there was some fear that they were getting very near over-production. This was not a suggestion for a restriction campaign but it was wise to send out a word of warning so that local Governments might consider the position.

The recommendations (not printed) of the sugar committee were carried unanimously.

The meeting adjourned *sine die.*

N. C. MEHTA,

Secretary.

SIMLA ;

The 18th July 1936.

APPENDIX I.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 11th June 1936, on Subject No. 1 (a) :—Decisions of the Governing Body obtained by circulation on the recommendations of the Advisory Board made in February 1936.

1. *Continuance of the Locust Research Scheme during the year 1936-37 at an estimated expenditure of Rs. 74,300.*—

Approved.

2. *Five years' extension of the scheme for breeding experiments in connection with the improvement of goats in the United Provinces conducted by Mr. A. E. Slater.*—

Extension sanctioned for one year in the first instance.

3. *Grant of Rs. 30,000 for 1936-37 to the Oil Section of the Harcourt Butler Technological Institute.*—

Approved.

The remaining recommendations of the Board will, as usual, come before the next meeting of the Governing Body.

APPENDIX II.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 6th June 1936, on Subject No. 1 (b) :—Appointment of Committees.

There are a number of schemes, progress reports, etc., on the Agenda of the Advisory Board which, the Vice-Chairman to the Council considers, might with advantage be examined in the first instance by suitable standing Committees of the Council or *ad hoc* Committees. A statement (Annexure I) is attached giving information as to the personnel of the various Committees, the subjects to be considered and the date, time and place of the meetings. A programme of work (Annexure II) for the full sessions of the Advisory Board is also attached.

ANNEXURE I.

Serial No.	Name of Committee.	Personnel.	Agenda.	Date and time of meeting.
1.	Botanical Sub-Committee.	1. The Vice-Chairman, I. C. of A. R. 2. The Agricultural Expert, I. C. of A. R. 3. Mr. L. D. Galloway. 4. Dr. B. P. Pal. 5. The Paddy Specialist, Madras. 6. The Economic Botanist (Rice), United Provinces. 7. The Paddy Specialist, Bihar. 8. The Director of Agriculture, Bengal. 9. The Director of Agriculture, Hyderabad (Deccan). 10. The Public Health Commissioner with the Government of India. 11. Dr. K. C. Mehta. 12. The Cerealist to Government Punjab, Lyallpur, Secretary, I. C. of A. R., *Secretary*.	18. (*i*) Consideration of the difficulties in securing material for plant breeding work in India. (*ii*) Surveys of plant breeding material. 19. Application from the Government of the United Provinces for a grant of Rs. 31,560 spread over five years for the provision of staff required for the early determination of oil values of oilseeds. 20. Progress reports on Agricultural Research Schemes (Botanical) :— (*i*) Annual report on the potato research scheme, Madras, for 1935-36. (*ii*) Annual report on the working of the Botanical sub-station, Karnal, for 1934-35. (*iii*) Progress report for 1935-36 on the scheme of research on the cultivation of medicinal plants and the study of food poisons by Lieut-Colonel R. N. Chopra. (*iv*) Annual report for 1935-36 on the Hyderabad Castor Breeding Scheme.	13th July 1936, 3 P.M.

ANNEXURE I—*contd.*

Serial No.	Name of Committee.	Personnel.	Agenda.	Date and time of meeting.
2.	Progress Reports Committee.	1. The Vice-Chairman, I. C. of A. R. 2. Mr. P. H. Carpenter. 3-4. The Directors of Agriculture, Bombay and United Provinces. 5. The Director, Imperial Institute of Agricultural Research. 6. Dr. L. A. Ramdas. 7. Professor P. C. Mahalanobis. 8. The Statistician, I. C. of A. R. Secretary, I. C. of A. R., *Secretary*.	21. Progress Reports on Agricultural Research Schemes—Meteorological and Statistical:— (*i*) Annual report for 1935-36 on the scheme of statistical studies by Prof. P. C. Mahalanobis. (*ii*) Annual report of the Agricultural Meteorological Branch for the year ended 21st August 1935.	13th July 1936, 3 P.M.
3.	Rice Research Sub-Committee.	1. The Vice-Chairman, I. C. of A. R., *Chairman (Ex-officio)*. 2. The Agricultural Expert, I. C. of A. R. 3-7. The Directors of Agriculture, Hyderabad, Mysore, Baroda, Cochin and Travancore. 8. The Paddy Specialist, Madras. 9. The Crop Botanist, Bombay. 10. The Economic Botanist, Bengal. 11. The Economic Botanist, (Rice), United Provinces. 12. The Rice Research Officer, Burma. 13. The Paddy Specialist, Bihar and Orissa. 14. The Officer-in-Charge, C. P. Rice Research Scheme. 15. The Economic Botanist, Assam. (Nos. 8–15: Subject to the approval of the local Government or the Director of Agriculture concerned if the officers do not find it possible to attend.) 16. The Senior Marketing Officer (Rice) Mr. A. M. Thomson. The Statistician, I. C. of A. R. Secretary, I. C. of A. R., *Secretary*.	11. Rice Research Scheme—Progress Reports:— (*i*) Madras, 1935-36. (*ii*) Bengal, 1935-36. (*iii*) United Provinces, 1935-36. (*iv*) Bihar and Orissa, 1935-36. (*v*) Report on the rice physiology scheme by Prof. R. H. Dastur. 12. Renewal of Rice Research Schemes:— (*i*) Application from the Government of Bihar for a grant of Rs. 1,56,374 spread over five years for the extension of the rice research scheme in Bihar. (*ii*) Application from the Government of Bengal for a grant of Rs. 1,41,333 spread over five years for the extension of the rice research scheme in Bengal.	14th July 1936, 10-30 A.M.

4. Marketing Sub-Committee.	1. The Vice-Chairman, I. C. of A. R. 2. The Agricultural Expert, I. C. of A. R. 3. The Animal Husbandry Expert, I. C. of A. R. 4. The A. M. A. to the Government of India. 5-16. All provincial Directors of Agriculture. 17. Mr. E. J. Bruen, Live-Stock Expert to the Government of Bombay. 18-20. 3 Senior Marketing Officers. 21. Sir C. V. Mehta, K.C.S.I. 22. Diwan Bahadur T. Raghaviah, C.S.I. Secretary, Imperial Council of Agricultural Research, *Secretary*, (*Ex-officio*).	26. Agricultural Marketing :—Progress Report, June 1936. 27. All-India Marketing Survey Reports. 28. Annual reports for 1935-36 on Provincial Marketing schemes :— (*i*) Madras. (*ii*) Bihar and Orissa. (*iii*) Burma. (*iv*) Sind. 29. Need for additional funds and staff for the marketing schemes in the Provinces :— (*i*) Representation from the Government of Madras. (*ii*) Representation from the Assam Government.	14th July 1936, 3 P.M.
5. Fruits Sub-Committee	1. The Vice-Chairman, Imperial Council of Agricultural Research, *Chairman (Ex-officio)*. 2. The Agricultural Expert, Imperial Council of Agricultural Research. 3. The Director of Agriculture, Madras. 4. The Director of Agriculture, Bombay. 5. The Director of Agriculture, Bengal. 6. The Director of Agriculture, United Provinces. 7. The Director of Agriculture, Punjab. 8. The Director of Agriculture, Bihar. 9. The Director of Agriculture, Orissa. 10. The Director of Agriculture, Central Provinces. 11. The Director of Agriculture, Assam. 12. The Director of Agriculture, North West Frontier Province. 13. The Director of Agriculture, Hyderabad. 14. The Director of Agriculture, Mysore. 15. The Director of Agriculture, Baroda. 16. The Chief Publicity Officer, Indian State Railways. 17. Mr. H. C. Javaraya, Senior Marketing Officer (Fruit). 18. The Agricultural Officer, Baluchistan. 19. Professor S. P. Agharkar, Calcutta University. 20. Mr. L. D. Galloway, Imperial Mycologist. The Secretary, Imperial Council of Agricultural Research, *Secretary* (*Ex-officio*).	23. Progress reports on fruit research schemes. (*i*) Annual report for 1935 on the Cold Storage Research Scheme, Bombay. (*ii*) Annual report for 1935-36 on the fruit research scheme in the United Provinces. (*iii*) A. Annual report for 1935-36 on the fruit research scheme in Bengal. B. Programme of work of the Horticultural Research Station at Krishnagar, Bengal, for 1936-37. (*iv*) Final report on the scheme of research on Wither Tip of Citrus trees by Dr. H. Chowdhry. 24. Application from the Government of the Punjab for a grant of Rs. 29,820 spread over five years for a scheme for a survey and control of fruit diseases in the Punjab by Dr. H. Chowdhry, Punjab University.	15th July 1936, 10-30 A.M.

ANNEXURE I—*contd.*

Serial No.	Name of Committee.	Personnel.	Agenda.	Date and time of meeting.
6	Tractor Sub-Committee.	1. The Vice-Chairman, Imperial Council of Agricultural Research, *Chairman* (*Ex-officio*). 2. The Agricultural Expert, Imperial Council of Agricultural Research. 3. Mr. C. P. G. Wade of the Burmah Shell. 4-11. The Directors of Agriculture, Madras, Bombay, United Provinces, Punjab, Central Provices, Bihar and Baroda, the Chief Agricultural Officer, Sind. The Secretary, Imperial Council of Agricultural Research, *Secretary* (*Ex-officio*).	16. Report of the tractor ploughing work conducted by the Burmah Shell Co., during 1935.	15h July 1936, 3 P.M.
7	Dry Farming Schemes Co-ordination Committee.	1. The Vice-Chairman, Imperial Council of Agricultural Research, *Chairman* (*Ex-officio*). 2. The Agricultural Expert, Imperial Council of Agricultural Research. 3. The Deputy Director of Agriculture, III Circle, Bellary. 4. The Soil Physicist, Coimbatore. 5. The Superintendent, Hagari Farm, Hagari (Madras Presidency). 6. The Director of Agriculture, Bombay Presidency, Poona. 7. The Soil Physicist to Government, Bombay, Poona. 8. The Deputy Director of Agriculture, Karnatik Division, Hyderabad (Deccan). 9. The Agricultural Chemist, Hyderabad (Deccan) 10. The Imperial Agricultural Chemist. The Secretary, Imperial Council of Agricultural Research, *Secretary* (*Ex-officio*).	22. Progress reports for the period December 1933—March 1935 and for 1935-36 on the Dry Farming scheme in Hyderabad (Deccan.)	16th July 1936, 2-30 P.M.

8	Soil Science Committee.	1. The Vice-Chairman, Imperial Council of Agricultural Research, *Chairman* (*Ex-officio*). 2. The Agricultural Expert, Imperial Council of Agricultural Research. 3. Rao Bahadur B. Viswanath, Imperial Agricultural Chemist. 4. Dr. J. K Basu, Soil Physicist, Sugarcane Research Scheme, Bombay Division. 5. Dr. E. Mackenzie Taylor, Director, Irrigation Research, Punjab. 6. Mr. A. P. Cliff, Deputy Director of Agriculture, North Bihar Range, Muzaffarpur. 7. The Agricultural Chemist to the Government of the Central Provinces. 8. Dr. P. G. Krishna, *Agricultural Chemist*, Hyderabad. 9. Dr. J. C. Ghosh, Dacca University 10. Professor J. N. Mukerjee, Calcutta University. 11. One irrigation representative from the Government of Bombay. 12. A representative of the Central Board of Irrigation. 13. Rao Bahadur V. A. Tamhane, Sind. 14. The Director of Agriculture, Punjab. 15. Dr. Nazir Ahmad. 16. Mr. P. H. Carpenter. 17. Mr. T. J. Mirchandani, Agricultural Chemist, Bihar and Orissa (visitor). 18. Dr. N. R. Dhar, Allahabad University. The Secretary, Imperial Council of Agricultural Research, *Secretary* (*Ex-officio*).	14. Report of the Soil Science Committee :— (*i*) Application from the Government of Bombay for a *grant* of Rs. 4,45,670 spread over five years for sub-surface investigation work carried out in the Lloyd Barrage area in Sind. (*ii*) Application from the Government of Bihar and Orissa for a grant of Rs. 13,708 spread over a period of three years for the determination of the nutrient content of Indian soils. (*iii*) Annual reports of the Physical Section of the Agricultural Experiment Station, Dacca, for 1934-35 and 1935-36. (*iv*) Annual report for 1935-36 on the work done under the Dacca University scheme for mechanical analysis of lateritic soils and the nutrition of the rice plant. (*v*) Annual report for 1935-36 on the scheme of investigations into the organic constituents of Indian soils by Prof. Ghosh of the Dacca University. (*vi*) Progress report for 1935-36 on the scheme of investigations into the properties of colloid soil constituents by Dr. J. N. Mukherjee of the Calcutta University. (*vii*) Final report on the scheme of research work on the effect of ions on plant growth by Dr. S. S. Bhatnagar.	16th July 1936, 3-30 P.M.
	Veterinary Progress Reports Committee.	1. Vice-Chairman, Imperial Council of Agricultural Research, *Chairman* (*Ex-officio*). 2. The Animal Husbandry Expert, Imperial Council of Agricultural Research. 3. Mr. F. Ware, Director, Imperial Institute of Veterinary Research. 4-13. Directors of Veterinary Services in the Provinces. 14. Rao Bahadur M. Vaidyanathan, Statistician, Imperial Council of Agricultural Research.	9. Progress reports on Animal Husbandry Schemes :— (*i*) Annual reports of Veterinary Investigation Officers in the Provinces (except *North West Frontier Province*) and in Hyderabad State for 1935-36. (*ii*) Annual report for 1935-36 on the Johne's disease investigation scheme in Mysore.	13th July 1936, 3 P.M.

ANNEXURE I—*contd.*

Serial No.	Name of Committee.	Personnel.	Agenda.	Date and time of meeting.
		15. Mr. R. N. Naik, Veterinary Investigation Officer, Bombay. 16. Mr. K. P. R. Kartha, Statistical Assistant, Animal Husbandry Bureau, Imperial Council of Agricultural Research. The Secretary, Imperial Council of Agricultural Research, *Secretary* (*Ex-officio*).	(*iii*) Annual report for 1935-36 on the Central Provinces Goats Virus vaccination scheme. (*iv*) Annual report for 1934-35 on the Punjab Parasitological scheme. (*v*) Annual report for 1935-36 (fifth year) on Mr. Slater's scheme for the improvement of goats in the United Provinces. 10. Application from the University of Madras for a grant of Rs. 21,300 spread over five years for a scheme for enquiry into helminthiasis of cattle in the Madras Presidency.	
10	Animal Nutrition Committee.	1. The Vice-Chairman, Imperial Council of Agricultural Research. 2. The Animal Husbandry Expert, Imperial Council of Agricultural Research. 3. Mr. A. V. Iyer, Offg. Physiological Chemist, Bangalore. 4. Dr. P. E. Lander, Agricultural Chemist, Punjab, Lyallpur. 5. Dr. K. C. Sen, Bio-Chemist, Imperial Institute of Veterinary Research, Muktesar. 6. Rao Bahadur B. Viswanath, Offg. Director, Imperial Institute of Agricultural Research. 7. Mr. J. R. Haddow, Veterinary Research Officer, Imperial Institute of Veterinary Research, Muktesar. 8. Mr. Z. R. Kothavalla, Imperial Dairy Expert Bangalore.	17. Progress report for 1935-36 on Animal Nutrition Schemes :— (*i*) Dacca. (*ii*) Coimbatore.	14th July 1936, 10-30 A.M.

		9. Mr. F. Ware, Director, Imperial Institute of Veterinary Research, Muktesar. 10. Col. H. C. Dibben, Offg. Director of Veterinary Services, Army Headquarters. 11. Dr. W. R. Akroyd, Director, Nutrition Research, Indian Research Fund Association, Coonoor. 12. Mr. T. F. Quirke, Director of Veterinary Services, Punjab. 13. Mr. M. Carbery, Agricultural Chemist, Bengal Government, Dacca. 14. Mr. J. K. Dubey, Director of Agriculture, Bhopal. 15. Mr. P. J. Kerr, Director of Veterinary Services, Bengal. 16. Mr. E. S. Farbrother, Director of Veterinary Services, Bombay. The Secretary, Imperial Council of Agricultural Research, *Secretary* (*Ex-officio*).		
11	**Special Sub-Committee for I. D. D. Courses.**	1. The Vice-Chairman, Imperial Council of Agricultural Research, *Chairman* (*Ex-officio*). 2. The Animal Husbandry Expert, Imperial Council of Agricultural Research. 3. The Imperial Dairy Expert. 4. The Director, Imperial Institute of Agricultural Research. 5. The Director, Imperial Institute of Veterinary Research. 6. The Director of Veterinary Services, Madras. 7. The Director, Military Farms. 8-10. The Directors of Agriculture, Madras, Punjab and Central Provinces. 11. The Principal, Patna Veterinary College. 12-13. Live-stock Experts, Bombay and Bengal. 14. Professor A. C. Aggarwala, Punjab Veterinary College. 15. Dr. Schneider of the Allahabad Agricultural Institute. 16. Mr. D. N. Khurody, Marketing Officer. The Secretary, Imperial Council of Agricultural Research, *Secretary* (*Ex-officio*).	15. New I. D. D. course for Provincial Agricultural and Veterinary Colleges—Report of the Special Committee.	15th July 1936, 10-30 A.M.

ANNEXURE I—*concld.*

Serial No.	Name of Committee.	Personnel.	Agenda.	Date and time of meeting.
12	Madras Fish Scheme Committee.	1. The Vice-Chairman, Imperial Council of Agricultural Research, *Chairman* (*Ex-officio*). 2. The Animal Husbandry Expert, Imperial Council of Agricultural Research. 3. The Agricultural Makerting Adviser or representative. 4-7. The Agricultural Department representatives of Madras, Bengal, Orissa and Bombay. 8. Mr. N. Brodie, Director, Industrial Research Bureau. 9. The Imperial Agricultural Chemist. 10. Mr. E. J. Bruen, Livestock Expert to the Government of Bombay. The Secretary, Imperial Council of Agricultural Research, *Secretary* (*Ex-officio*).	25. Application from the Government of Madras for a grant of Rs. 92,487 spread over three years for a scheme of research for improving the fishing industry and developing the supply of fishmanure.	15th July 1936, 3 P.M.
13	Standing Cattle Breeding Committee.	1. The Vice-Chairman, Imperial Council of Agricultural Research, *Chairman* (*Ex-officio*). 2. The Animal Husbandry Expert, Imperial Council of Agricultural Research. 3. Mr. T. F. Quirke, Director of Veterinary Services, Punjab. 4. Captain C. E. McGuckin, Assistant Director, Military Dairies, Lahore Cantonment. 5. Mr. E. J. Bruen, Livestock Expert, Bombay. 6. Chowdhry Dost Mohammad Khan, Proprietor, Jahangirabad Cattle Farm, District Montgomery. 7. Mr. C. H. Parr, Deputy Director of Agriculture, Bundelkhand.	30. Cattle improvement scheme initiated by His Excellency the Viceroy.	16th July 1936, 3 P.M.

8. Mr. Zal R. Kothavalla, Imperial Dairy Expert Bangalore.
9. Major P. B. Riley, Director of Veterinary Services, Bihar and Orissa.
10. Mr. Wynne Sayer, Imperial Institute of Agricultural Research, Delhi.
11. Mr. T. J. Egan, Director, Civil Veterinary Department, United Provinces.
12. Senior Marketing Officer dealing with Livestock.
13. Sardar Datar Singh, Montgomery.
14. Mr. K. P. R. Kartha, Statistical Assistant, Animal Husbandry Bureau, Imperial Council of Agricultural Research.
15. Mr. F. J. Gossip, Livestock Expert, Bengal.
16. Mr. S. M. A. Shah, Superintendent, Civil Veterinary Department, North West Frontier Province.
17. Mr. R. W. Littlewood, Deputy Director of Agriculture (Livestock), Madras.
18. Mr. J. V. Takle, Deputy Director of Agriculture (Livestock), Central Provinces.
19. Mr. R. C. Woodfort, Deputy Director of Agriclture (Livestock), Assam.
20. Sardar Santokh Singh, Shahkot, Punjab.
21. Mr. F. Ware, Director, Imperial Institute of Veterinary Research, Muktesar.
22. Mr. N. M. Kothavala, Ahmedabad.
23. Sir Chunnilal V. Mehta, Bombay.
24. Director of Agriculture, Mysore.
25. Pattagar of Palayakotai.

Secretary, Imperial Council of Agricultural Research, *Secretary (Ex-officio)*.

ANNEXURE I-A.

CHART.

Name of Committee and time of its meeting.

Date.	Time.	Agriculture.	Animal Husbandry.	Time.
July—				
13th	**3 P. M.**	**(i) Botanical Sub-Committee**	Veterinary Progress Reports Committee	3 P.M.
		(ii) Agricultural Progress Reports Committee.		
14th	**10-30 A.M.**	**Rice Research Sub-Committee**	Animal Nutrition Committee	10-30 A.M.
	3 P.M.	**Marketing Sub-Committee.**		
15th	**10.30 A.M.**	**Fruits Sub-Committee**	Special Sub-Committee for I. D. D. Courses	10-30 A.M.
	3 P.M.	**Tractor Sub-Committee**	Madras Fish Scheme Committee	3 P.M.
16th	**2-30 P.M.**	**Dry Farming Schemes Co-ordination Committee**	Standing Cattle Breeding Committee	3 P.M.
	3.30 P.M.	**Soil Science Committee.**		

ANNEXURE II.

Programme of work for full sessions of the Advisory Board, July 1936.

Date.	Time.	Forenoon.	Time.	Afternoon.
July 13th ..	11 A.M. ..	Items 1, 2, 3, 4, 5 & 6 of the Agenda ..	..	....
July 16th ..	10-30 A.M. ..	Items 7, 8 and 13 .. .. Report of the Veterinary Progress Reports Committee (Items 9 & 10). Report of the Botanical Sub-Committee (Items 18, 19 & 20).	..	....
July 17th ..	10-30 A.M. ..	(*i*) Report of the Agricultural Progress Reports Committee (Item 21). (*ii*) Report of the Animal Nutrition Committee (Item 17). (*iii*) Report of the Rice Research Sub-Committee (Items 11 & 12). (*iv*) Report of the Tractor Sub-Committee (Item 16). (*v*) Report of the Madras Fish Scheme Committee (Item 25).	3-00 P.M.	(*i*) Report of the Marketting Sub-Committee (Items 26, 27, 28 & 29). (*ii*) Report of the Fruits Sub-Committee (Items 23 & 24). (*iii*) Report of the Special Sub-Committee for I. D. D. courses (Item 15).
July 18th ..	10-30 A.M. ..	(*i*) Report of the Dry Farming Schemes Co-ordination Committee (Item 22). (*ii*) Report of the Soil Science Committee (Item 14). (*iii*) Report of the Cattle Breeding Committee. (Item 30).	..	....

NOTE.—Attention of members interested is invited to the Symposium arranged by the National Institute of Sciences, India, for 19th July 1936.

SUBJECT.—The Nitrogen Supply of Indian Soils.

APPENDIX II-A.

Supplementary note by the Secretary, Imperial Council of Agricultural Research, dated the 30th June 1936, on Subject No. 2 :—Appointment of Mr. B. K. Badami, Director, Veterinary Department, Hyderabad, on the Cattle Breeding Committee.

At its meeting held in February 1936, the Advisory Board considered the question of the reconstitution of the Cattle Breeding and the Dairy Committees of the Council (Subject No. 22 of the Agenda of that meeting). The recommendations made by the Board have been accepted by the Governing Body. The Cattle Breeding Committee as now reconstituted consists of 25 members. In view of the fact that Mr. B. K. Badami, Director, Veterinary Department, Hyderabad, is in charge of the Hingoli breeding farm, it is proposed to add him to the Cattle Breeding Committee. The proposal is for the consideration of the Advisory Board.

APPENDIX III.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 11th July 1936 on Subject No. 3 :—Reports of the Sub-Committees appointed to consider the draft briefs for experts in connection with the scientific survey of the work in progress and contemplated under the auspices of the Imperial Council of Agricultural Research.

The report of the Crops and Soils Sub-Committee on the "Review of work of the Imperial Council of Agricultural Research (Agriculture portion)" (Annexure) which met on the 6th and 7th July 1936, together with the draft of brief (not printed) circulated to the Committee is enclosed. The report of the Dairy Science and Cattle Improvement Committee (Annexures I and II of Appendix III-A) will be circulated in due course.

ANNEXURE.

Report of the Sub-Committee on the "Review of work of the Imperial Council of Agricultural Research (Agriculture)—Crops and Soils"—held at Rock House, Simla, on the 6th and 7th July 1936.

PRESENT :

Sir Bryce Burt, Kt., C.I.E., M.B.E. (*Chairman*).
Mr. R. G. Allan (Crops).
Dr. W. Burns (Crops).
Mr. M. Carbery (Soils).
Mr. P. H. Carpenter (Soils).
Dr. J. K. Dubey (Soils).
Mr. J. W. Jenkins (Crops).
Mr. J. C. McDougall (Crops).
Mr. K. McLean (Crops).
Dr. J. N. Mukherjee (Soils).
Mr. R. L. Sethi (Crops and Soils).
Dr. F. J. F. Shaw (Crops and Soils).
Mr. N. C. Mehta, I.C.S., *Secretary*.

The Committee met in two sections on two successive days, the first day being specially devoted to crops and the second day to soils.

2. The Chairman explained to the meeting the terms of reference which it was proposed to give to the Scientific Expert from England. After some discussion, the terms of reference were adopted as follows :—

(1) Generally, to advise as to the manner and extent to which the Research Council has discharged its primary duties of co-ordinating and promoting agricultural research in India so far as it relates to plant industry, to comment on the value of what has been accomplished and to suggest directions in which improvements may be affected ;

(2) To draw attention to any important *lacunae* in the Council's present research programme and to any undesirable overlapping ;

(3) To advise on the most promising lines of future developments having regard to recent advances in science ;

(4) To advise on the policy to be followed regarding schemes now in operation, and which of them should be renewed at the end of their term ;

(5) To advise which of the schemes now on the 'waiting list' should be financed and which should give way to new schemes (Page 4 of introduction to Brief);

(6) To comment on the present working of individual schemes (or groups of schemes) and to suggest improvements.

3. The Chairman next explained the material which it was proposed to place before the Scientific Expert. This material would be as follows :—

(1) Review of Agricultural Operations since the beginning of the Imperial Council of Agricultural Research from 1928 to 1935 ;

(2) The Imperial Council of Agricultural Research Annual Reports and those of the Indian Central Cotton Committee ;

(3) Rules and regulations of the Council and a note on the financial aspect (to be provided by the Vice-Chairman later) ;

(4) Proceedings of the Advisory Board and the Governing Body ;

(5) A copy of each individual scheme as sanctioned including the letter of sanction.

(6) All progress reports with the comments of the Adivosry Board ;

(7) List of publications and set of publications ;

(8) The memoranda circulated to the Advisory Board and Governing Body in February 1936 without appendices ;

(9) The 'brief' (not printed) now prepared.

4. The Committee decided that any additions in the introductory portions of each section of the review might be supplied to the Council before the end of July 1936. The Committee then examined the draft "brief" (not printed) and recommended the following alterations :—

Crop Production.

(1) *Rice.*

Page 2.

(*i*) The 1935 export figures to be added in August 1936.

(*ii*) Small paragraphs about rice work done in the Central Provinces will be supplied by the Director of Agriculture, Central Provinces and will be added at page 2 after first paragraph.

(*iii*) *Pages 4—9.*

In the 'remarks' column of the statement of schemes the date of commencement of each scheme to be inserted.

(*iv*) *Page 10. Paragraph 3.*

The sentence "The rice crop of Bengal, after meeting local demands shows a surplus of about 5 per cent. available for export" to be deleted.

(*v*) *Page 11. Paragraph 2.*

For the sentence "With a gram rotation .... crop" substitute "Manurial experiments were carried out on rice grown in rotation with gram. The addition of nitrogen or phosphate, either singly or in combination, produced no significant effect on the yield of the crop".

(*vi*) *Page 12. Paragraph 5 under Central Provinces 3rd sentence.*

The second part of the sentence " and application of the product shown to enhance yields to a marked extent " to be deleted. The first part of the sentence " A cheap and practical method of converting bones to fertilisers has been worked out " to remain.

(2) *Wheat.*

(*i*) *Page 2, line 8.*

For the words " In the Punjab " the following to be inserted :—

" Wheat-breeding work commenced in the Punjab under Mr. Milne in 1907, the most important result being Punjab 8-A which was issued in 1913 and now occupies 2½ million acres ".

(*ii*) *Page 2, line 13.*

After the words " In the Central Provinces ", insert " work was commenced by Mr. Evans in 1908 and has been continued first at Hoshangabad and then at Jubbulpur. The principal results have been the wheats known as Sherbati, especially A.-113 and A.-115, which are grown on over half-a-million acres. The question of wheat breeding for the black soil tract is at present under consideration by the Standing Wheat Committee ".

(3) *Cotton.*

The words " largely financed " to be substituted for the word " controlled ".

(4) *Sugarcane.*

(*i*) *Page 7.*

Scheme No. (16) should go to section II on page 8.

(*ii*) *Page 11 : Bihar and Orissa Sugarcane Scheme, 3rd paragraph.*

" A wide range of problems has been investigated " to be deleted. " Agronomical work has been done on " to be replaced by " Agronomical work includes varietal trials ". At the end of the paragraph after the words " local growers ", the words " for extended testing " to be added.

(*iii*) *Page 15 : Sugarcane research North West Frontier Province, 2nd paragraph, 2nd sentence.*

" Owing to lack of funds. comparatively little research has been carried out so far " to be deleted.

(*iv*) *Page 18.*

The last paragraph to be omitted.

(*v*) *Page 19. Summary, Scheme No. 16.*

The scheme for sugarcane crushing and *gur* boiling experiments in Bengal to be added to completed schemes, (Part II).

(*vi*) The British Scientist to be asked to advise on the Council's programme of work in sugar technology so far as he considers necessary to appraise the position generally.

(5) and (6) *Jute and Fibres.*

(*i*) *Page 4, paragraph 6.*

" Scheme for investigation into the extraction of Flax Fibre in Bengal ", for " Linen Research Association " the words

"Director of the Linen Research Association" to be substituted.

(*ii*) *Page 5, first line.*

The word "straw" to be substituted for the word "fibre".

(7) *Tobacco.*

(*i*) *Page 1, paragraph 2, line 3.*

"And the production of hybrids between local and American types" to be inserted after the words "local types".

(*ii*) *Page 1, paragraph 2, line 6.*

The words "local tobaccoes" to be deleted and the following to be substituted "exotic tobaccoes grown locally".

(8) *Oilseeds.*

(*i*) *Page 2.*

After the words "Upper Gujerat" the following new sentence to be inserted :—

"In Bombay one or two strains of castor were isolated for high yield and high oil content and comparative trials are being made of linseed varieties".

(*ii*) *Page 3, item 1 (c).*

The name of the Economic Botanist to be inserted.

(*iii*) *Page 3, item 2 (c).*

The name (Mr. J. A. H. Duke) to be omitted.

(*iv*) *Page 6. Grant to oil section of the Harcourt Butler Technological institute, Cawnpore,* last para.

For the words "has now been transferred to" substitute 'is now the concern of'.

(*v*) *Page 9. United Provinces, 2nd line* (heading).

The word "educational" to be substituted for "education".

(*vi*) *Page 10.*

Scheme for the investigation of coconut leaf disease in the Cochin State, to be transferred to page 13 of Plant Protection section immediately after the Travancore Coconut scheme, reference only to be given here.

(9), (10) and (11) *Tea, Coffee and Rubber.*

The Committee hoped that the experts will be able to visit Tocklai.

(12) *Fruit.*

(*i*) Mr. Jenkins and Dr. Burns both promised to send a few lines about work in their respective provinces to be added at the end of page 1.

(*ii*) Headings of provincial schemes to be re-numbered.

(*iii*) *Page 10, paragraph 2 Central Provinces Fruit Scheme.*

Delete the last sentence "The Central Provinces .... material".

(*iv*) *Page 10. Mysore Fruit Scheme.*

Description requires revision to accord with the approved programme.

(*v*) *Page 11.*—Bombay scheme for the improvement of papaya-breeding and cultural practices

Last sentence to be deleted.

(*vi*) *Page 12. Under Section IV.*—Schemes approved and awaiting funds—

Add " No. 13—Bombay Scheme for the improvement of papaya-breeding and cultural practices ".

(13) *Fodder crops and Grasses.*

(*i*) *Page 1, line 13.*

Omit the words ' rotational grazing and fencing '.

(*ii*) *Page 1, line 25.*

After North-West Frontier Province, add ' and Sind '.

(*iii*) *Page 1, line 30.*

Omit the words ' Kalar-resistant and is '.

(*iv*) *Page 1, 2nd paragraph, line 7.*

For the word ' parts ' substitute ' Provinces '.

(14) *Millets.*

(*i*) *Page 1, 3rd Paragraph.*

Delete the last sentence, " In the latest .... alone ".

(*ii*) *Page 1, 4th paragraph, 2nd line.*

For the words ' Surat and in Khandesh ', substitute ' Surat, Khandesh, Sholapur and Dharwar ". Change " two " to " several " in line three.

(*iii*) *Page 2, Bajra, paragraph 1, line 8.*

For " Karjat " substitute " Niphad and Nadiad ".

Mr. Jenkins will supply a note.

(15) *Miscellaneous Crops.*

The subject " Miscellaneous Crops " should go at the top of the page. The first introductory sentence should be " It is not practicable to review all the work on miscellaneous crops in progress in India, and reference is only made here to research schemes financed by the Council. Research on barley ...... plants ". Add a note on the work done by Rangaswami Ayyar at Coimbatore.

(16) *Potatoes.*

(*i*) *Page 1, line 5.*

For ' British ' substitute ' European '.

(*ii*) *Page 4, 2nd paragraph, line 6.*

Delete the words ' it is believed that '.

Plant Protection against disease.

(*i*) Dr. Burns and Mr. Jenkins both promised to send in notes about work in their respective provinces.

(*ii*) *Page 9.* (Scheme for the investigation of Cereal Rusts Continued).

Above the 3rd paragraph add ' Khapli Wheat-*Triticum Dicocum* is a cultivated crop in India and has been a useful parent in breeding for rust-resistance since it is susceptible to only one of these physiologic forms of black rust '.

(*iii*) *Page 11, fourth line from bottom.*

After ' waterways ' add ' adjacent fields '.

(*iv*) *Page 13, after paras.*

Regarding ' Travancore ' scheme, the scheme on coconut root disease in Cochin should be added.

Insect Pests.

Page 2.

Cut out paragraphs 4 and 5.

Plant Physiology and Plant Bio-Chemistry.

(*i*) *Page 1.*

Mr. Jenkins promised to send in a note for addition on the work at Sakrand on the water requirements of crops.

(*ii*) *Page 8. Dacca University Scheme for Mechanical Analysis of lateritic soils and nutrition of the rice plant.*

It should be verified that the account of the work at Dacca under Soils includes all the work under the nutrition of the rice plant. (Two notes have been added).

Genetics and Cytology.

At the end of page 2 mention should also be made of the work on cotton genetics in progress under Hutchinson at the Indore Institute of Plant Industry which is financed by the Indian Central Cotton Committee. on cotton genetics under Kottur at Dharwar and on rice by Thadani in Sind.

Mr. Jenkins promised to send in a note about rice genetics in Sind.

Field Technique.

(*i*) At the beginning of 2nd paragraph add the following new sentence :—

' Under the stimulus of the new teaching by Fisher on the subject of experimental error the staffs of various provinces had been attempting new lay-outs of field experiments, and a certain amount of formal teaching on this subject had been given to students in agricultural colleges."

(*ii*) Add references to work of Sircar, Mahalanobis and Dobbs after the word ' rice ' in line 5 paragraph 1.

Economic Enquiry into the Cost of Production of Crops in the principal sugarcane and cotton-growing tracts in India.

Page 2.—After No. 6 ' Hyderabad State ', add No. 7, ' Tharparkar ', and re-number the subsequent items accordingly.

The following note should be added :

N.B.—It is to be understood that this scheme will have finished so far as the provincial records are concerned, but that the results will not have been worked out. Only the general observations of the British Scientist are expected.

5. *Soils.*

The Committee considered the section of the brief relating to soils on the 7th July 1936.

(*i*) *Page 2. Reclamation of Alkali Soils.*

Messrs. Burns and Jenkins will submit additional notes.

(*ii*) *Page 2, paragraph 2, line 1.*

Change " (1929) " to " 1927—36 at Sakrand and other places ".

Line 4.

For the word " included ", substitute " which include ".

Line 5.

After the word " water " add " special rotations of crops ".

Line 6.

For the word ' gave ', substitute ' have given '.

Line 7.

For the words " appeared to renovate " substitute " has assisted in the reclamation of ".

(*iii*) *Page 3. Base exchange and related soil properties* (*continued*).

The last sentence under this subject requires to be checked.

(*iv*) *Page 3.*

Last paragraph, first sentence. Complete reference to Dr. D. L. Sahasrabuddhe's works should be made.

(*v*) *Page 4, line 19.*

Delete the word ' careful ' and make the letter ' e ' of the word ' experiments ' capital.

Page 4, line 20.

For the words ' to support of these findings ' substitute ' to support some of these findings, and the matter is still under investigation '.

Page 4, paragraph 1.

The last two sentences " In the United Provinces ....per acre " should be omitted.

(*vi*) *Page 4, under " Soil Surveys ".*

Delete the first sentence.

In line 2, after the word ' areas ' insert ' in India '.

In line 3, after the word ' recognisable ' insert ' agricultural '.

(*vii*) *Page 5.*

At the end of the 1st paragraph, a reference should be made to the soil map of India prepared by the Geological Survey of India in 1930, and published in the Indian Journal of Agricultural Science, 1935, with an explanatory note.

Page 5, under soil colloids, add a sentence at the end of the paragraph. " Soil colloids, particularly as determining the agricultural behaviour of different types of Deccan soils is being investigated in the sugarcane research scheme at Padegaon ".

(*viii*) *Page 6, 1st paragraph.*

Under Soils and irrigation, a cross reference should be given— ' see also Bombay sugarcane scheme '.

In the same paragraph, line 10, for the words ' land was continued ' substitute ' land is being continued '.

In the 2nd paragraph under this heading, line 3, cut out the words ' and Sind Governments ', and delete the sentence following.

Page, 6, under ' Fertilizers ', line 7, for the words ' difficulties experienced ', substitute ' difficulties have been experienced in certain areas '.

Ibid Line 9, for the words ' decomposition has ' substitute ' decomposition which have '.

(*ix*) *Page 8.*

Add the following sentence at the end :—

' The work done by agricultural engineers in various provinces on the improvement of bullock drawn implements is summarised in the Review of Agricultural Operations '.

(*x*) *Page 9.*

Details of staff, etc., on the Dacca University scheme should be inserted here.

In this case and in all similar statements, the qualifications of persons ought to appear after the name.

Professor Mukherji suggested that summaries of the various schemes should be prepared for the British Scientist and should appear in the appendix and that cross reference under the respective scheme should be given in cases where summaries have been received from authors. The committee was of the opinion that they would welcome any summaries by the authors of schemes, which should form an appendix.

(*xi*) *Page 13.*

Add cross reference to Physiology of Dacca scheme.

(*xii*) *Page 14.*

At the end of 2nd paragraph add ' see page 8 under Plant Physiology '.

Schemes should be arranged in the same order as they appear in the summary on page 21.

Mr. Carbery has kindly promised to supply a summary in respect of the Bengal scheme.

Paragraph 2 of the Allahabad scheme, line 1.

After the words ' to confirm ' add ' some of '.

(*xiii*) *Page 15.*

The last sentence under the ' Scheme for standardisation of physico-chemical single value measurements for Indian soils ' should be deleted, *viz.* " Although agreement .... standards ".

(*xiv*) *Page 16. Schemes for Dry Farming Research in Bombay, Madras, Hyderabad and Punjab, 3rd paragraph, 1st line.*

After the word ' Bijapur ' add ' representing two very different soil types '.

3rd line in the same paragraph.

Omit the words ' very ' and the words ' famines and '.

(*xv*) *Page 17, 2nd paragraph.*

For the 2nd sentence substitute the following :—

" The annual loss of soil from ploughed land under the heavy rainfall at the beginning of the monsoon is often of the order of 30 tons per acre and in abnormal cases may go up to 100 tons, and the losses of lime and nitrogen also occur ".

(*xvi*) *Page 18.*

A brief summary of the soil work in progress under the Central Provinces rice scheme should be added to this page.

After the end of the dry farming schemes a note should also be inserted giving cross reference to page 13 of the note on *sugar* under crop improvement, and a further note dealing more fully with the soil work at Padegaon should be added.

Page 18, under Tractor Ploughing Experiments by the Burma-Shell Company. In paragraph 2, last line.

After the word ' made ', add ' in the selection of tractors and '. After the words ' improvement of ' in the same line add the word ' the '.

(*xvii*) *Page 19.*

Under ' Scheme for an investigation of changes in the microflora of *kalar* soils in Sind ', in 2nd paragraph, for the first sentence substitute. " The object of the scheme is to supplement existing research on the formation and reclamation of *kalar* lands ".

Page 19, under " Scheme for research on the economics of irrigation from tube-wells ".

In the last line of first paragraph, for the words ' and funds will be allotted when available ', substitute ' funds have not been allotted '.

(*xviii*) *Page 21, under Summary.*

No. 4 under section I should be transferred to Section III and the schemes should be re-numbered. A reference should also be made to the additions now made.

In Section II, item No. 8 should read ' Physico-chemical single value measurements suitable for Indian soils by Dr. A. N. Puri, Lahore '.

Item 15.

Add Dr. Puri's new scheme in text.

A summary of No. 15 should be included in the text at the bottom of page 20.

Plant Physiology and Plant Bio-Chemistry.

Page 1.

Dr. Burns promised to send a note pertaining to earlier work on the physiology of rice plant and water culture at Karjat.

Page 8.

A note on the work on nitrogen supply of the rice plant and on pot culture experiment should be added to Plant Physiology.

Page 10.

Mr. Sethi's brief regarding ' A note on rice physiology by Dr. Dastur ' should be added to Plant Physiology.

Page 11.

The order of the schemes in the text should be adjusted to follow the order in the summary.

Tour programme of the British Expert.

Tocklai was added to the programme.

APPENDIX III-A.

Supplementary note by the Secretary, Imperial Council of Agricultural Research, dated the 12th July 1936, on Subject No. 3 :—Reports of the Sub-Committees appointed to consider the draft briefs for experts in connection with the scientific survey of the work in progress and contemplated under the auspices of the Imperial Council of Agricultural Research.

In continuation of the note dated the 10th July, 1936 (Appendix III), the report of the Dairy Science and Cattle Improvement Sub-Committee on the " Review of work of the Imperial Council of Agricultural Research " (Annexures I and II) which met on the 8th, 9th and 10th July 1936, together with the draft of the brief (not printed) circulated to the Committee is enclosed.

ANNEXURE I.

Proceedings of the meeting of the Dairy Science and Cattle Improvement Sub-Committee appointed by the Imperial Council of Agricultural Research, held at 11 A.M., *at " Rock House ", Simla, on Wednesday, the 8th July, 1936.*

The following were present :—

1. Col. A Olver, the Animal Husbandry Expert, Imperial Council of Agricultural Research (*Chairman*).
2. Sir Chunilal V. Mehta.
3. Mr. Zal R. Kothavalla, Imperial Dairy Expert, Bangalore.
4. Col. Pender, Director of Military Farms, Army Headquarters, Simla.
5. Mr. E. J. Bruen, Livestock Expert, to the Government of Bombay.
6. Sardar Datar Singh of Montgomery.
7. Mr. F. Ware, Director, Imperial Institute of Veterinary Research, Muktesar.
8. Mr. C. H. Parr, Deputy Director of Agriculture, U. P.
9. Mr. B. K. Badami, Director, Veterinary Services, Hyderabad State.
10. Mr. W. S. Read, Assistant Superintendent, Government Cattle Farm, Hissar.
11. Sardar Kartar Singh, Marketing Officer and the Officer-in-charge of the Economic Enquiry, Punjab.
12. Mr. A. C. Aggarwala, Officer on Special Duty (Animal Husbandry Section), Imperial Council of Agricultural Research (*Secretary*).

Colonel Olver thanked the members for coming and observed that the main object of getting the foreign Expert out was to place before him a review of the present position regarding the Dairy Industry in India and

after he had had an opportunity of studying the conditions in different parts of the country to obtain his advice as to the lines on which dairying might be developed. The draft appreciation (not printed) was only intended to give a bird's eye-view of the existing position and to indicate its potentialities.

Regarding research in dairying he pointed out that little had so far been done and that he wished the members to scrutinise the draft carefully.

The draft terms of reference for the Foreign Dairy Expert were then discussed in detail, item by item. On the suggestion of Mr. Parr, item 1 was modified as under :—

" 1. In view of the economic importance and value to general agricultural development of improved production and handling of milk and milk products, keeping in view the requirements of cattle for agriculture ; to advise as to the lines to be followed in order to secure

(*a*) increased and more economical production, and

(*b*) improved collection, handling and disposal of milk and milk products ; "

On the suggestion of Mr. Ware item 4 was changed to read as under :—

" 4. To advise as to what additional technical and scientific staff and facilities are required for the purposes ; "

The Chairman then placed before the meeting three lists of Animal Husbandry Research schemes showing (*a*) those in progress, (*b*) those awaiting allotment of funds and (*c*) those awaiting approval, in order to decide which should be referred to the Foreign Expert. After discussion it was agreed that schemes in progress Nos. 6, 8, 11, 24 ; and Nos. 5, 6, 8 (*iii*) and (*iv*), 10 and 11 awaiting allotment, and schemes Nos. 3 and 4 of those awaiting approval should be dealt with by him under item No. 5 of the terms of reference. Under item No. 6 he would be asked to comment upon schemes Nos. 2, 3, 4, 5, 9, 13, 14, 16, 18, 21, 22, 25, of those in progress, on No. 7 of those awaiting allotment, and No. 2 of those awaiting approval.

The meeting was then adjourned at 1 P.M., to meet again at 3 P.M., in the Small Committee Room in the Legislative Assembly Building.

ANNEXURE II.

Proceedings of the meetings of the Dairy Science and Cattle Improvement Sub-Committee of the Imperial Council of Agricultural Research held at Simla on the 8th, 9th and 10th July, 1936

The following were present :—

1. Colonel A. Olver (*Chairman*).
2. Mr. A. C. Aggarwala (*Secretary*).
3. Mr. B. K. Badami.
4. Mr. E. J. Bruen.

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5. Sir Chunni Lal V. Mehta (on the 8th only).
6. Sardar Datar Singh.
7. Sardar Kartar Singh.
8. Mr. Z. R. Kothavalla.
9. Mr. C. H. Parr.
10. Colonel W. S. Pender (on the 8th and 9th only).
11. Mr. T. F. Quirke (on the 10th only).
12. Mr. W. S. Read.
13. Mr. F. Ware.

First Session—8th July, 1936, from 11 A.M. to 1 P.M., (Rock House).

The proceedings are given in Annexure I.

Second Session—8th July, 1936, from 3 P.M. to 5 P.M., in the Legislative Assembly Building.

Since Sir Chunilal could not be present on the 9th July Section IV on "Production of Cattle Feeds" of the Draft Appreciation (not printed) was taken up first for discussion which mainly centred on two points, *viz.*, (*a*) to what extent special fodder crops are available for the feeding of cattle, and (*b*) how substitution of fodder crops may affect income from farming. Due to the lack of complete statistical data on the above points members found it difficult to arrive at a definite figure of production of fodder and it was decided that to arrive at reliable figures the Season and Crop Reports should be consulted. After discussion it was also agreed that the portion after 450 mds. in paragraph 36 should be deleted. This figure also required to be amended so as to show a correct weighted average. It was decided that the statement of concentrates given on page 49 was not a comprehensive one and should be amended. It was agreed that paragraph 34 should be recast and a sub-head dealing with Natural Fodder Resources Including Grazing Areas added, on which Mr. Read was requested to prepare a short note. Other minor changes that were agreed upon would make paragraphs 33 and 36 read as follows :—

"33. *Area under fodder crops.*—Statement VII shows the area under fodder crops in the various provinces of British India. The total area under cultivated fodder crops is about 10 million acres, or roughly 5 per cent of the net sown area. About 43 per cent of this is in the Punjab, 21 per cent in Bombay and 15 per cent in the United Provinces and the rest is .... estimate. But even at that estimate 20 head of stock would obtain .... 6 annas".

"36. *How substitution of fodder crops for money crops may affect income from farming.*—In order to make fodder available it would be necessary to grow catch crops for fodder on available fallow lands and to substitute intensive cultivation of fodder crops for some of the cash crops the production of which .... existing ration. It will be seen from Statement VIII that the average production per acre of different kinds of fodder cultivated on Government farms in India from irrigated land is about 450 mds., but such returns cannot be reached by the ordinary ryot".

The meeting adjourned at 5 P.M., to meet again on the 9th July at the Legislative Assembly Building at 10 A.M.

On the 9th, Colonel Olver informed the meeting that he had obtained Seasons and Crops Reports but that it was not possible without local knowledge to obtain accurate details from them. The Heads of Provinces would therefore be asked to interpret figures relating to grazing areas, as to fodders and other crops. Further he stated that the table of Concentrates on page 49 had been made more exhaustive, so as to give in detail all the information furnished by Provinces. The first 32 paragraphs of the Draft Appreciation (not printed) were then gone into in detail and the amendments proposed are given in Annexure III.

On the 10th, before opening the proceedings, Colonel Olver referred to the sad death of Mian Sir Fazl-i-Hussain who was associated with the Imperial Council of Agricultural Research almost from its inception and a vote of condolence was passed, all members standing.

The remaining items of the Brief (not printed), *viz.*, from paragraph 38 to paragraph 53, including the Statements and the Appendices, were discussed in detail and the amendments proposed are embodied in Annexure III.

ANNEXURE III.

Amendments recommended in the various paragraphs of the Draft Appreciation (not printed).

Para. 1.

Line 8.—Add after " production ", " A very small percentage of the cows, however, are economic breeders or milk producers but the percentage of economic milk producers amongst the buffaloes is much higher ".

Para. 2.

(*a*) Instead of " Dairies " read " Dairy Farms ".

Line 2--should read " over India situated generally in the vicinity of towns."

In line 4th instead of " cows " read " animals ".

Line 6—should read " is the most satisfactory source of wholesome milk produced in India, *i.e.*, from ".

(*b*) *3rd and 4th line.*—For " they keep two to four cows or buffaloes each " read " four or more cows or buffaloes each ".

Line 5—after " conditions " add " in addition there are considerable numbers of *gowallas* in certain areas who maintain their animals, dry and in milk, and rear their youngstock, under very satisfactory conditions.

Add sub-para. (*c*).—By far the greater proportion of the milk is, however, produced by financiers who purchase cows and buffaloes and dispose of them when the milk-yield becomes uneconomic.

Page 2.

1st line.—**For (*c*) read (*d*) and for " cows " read " milch animals ".**

***3rd line* should read as " (e) certain well-to-do people keep milch animals of their ".**

4th line.—For " cows " read " animals ".

7th, 8th, 9th and 10th lines should read as " (*f*) *Cultivators.*—These maintain large numbers of cattle primarily for producing bullocks. The females are however often milked and any surplus milk disposed of. Some of them especially those in better circumstances maintain she-buffaloes or goats as well for their milk ".

Para. 3, line 2.—After 2 (*b*) add " and 2 (*c*) ".

Para. 3, line 3.—Add " and financiers " after " *Gowalas* ".

Para. 3, line 3.—After " statement " add " I on page 33 " and delete " appended to this ".

Para. 3, lines 6 and 7.—Delete " immediate ".

Para. 3, line 10.—For " cows " read " animals ".

Para. 3, line 16.—Delete " probably not " and for " many " read " some ".

Para. 4.

Line 11.—Delete " There are about 500 such so-called dairies, in the whole of India ".

Line 13.—After " them ", read " In addition, there are large numbers of unlicensed."

Page 5.

2nd line.—For 2 (*c*), (*d*) and (*e*) read " 2 (*d*), (*e*) and (*f*) ".

In line 3 after " also " read " In certain areas, there are predominantly dairy districts in which large quantities of milk are produced. This is sold as milk or as ghee or other dairy products, while in other districts most of the milk left over after feeding the calf is consumed at home or disposed of ", instead of " In predominantly.................... at home ".

Para. 6.

Line 6.—For " large " read " small " and in line 8 for " improve " read " maintained."

Para. 7.

Line 6.—After " average " add " taking India as a whole ".

Line 8.—After " by " add " village ".

Delete first sentence and transfer the rest to Para. 12.

Para. 8.

In the table on page 4, figures given in lbs. should be changed into ozs.

Para. 9.

(*b*) *First Line.*—For " fresh " read " as such ".

Line 4th.—For " dairy " read " dairies ".

Line 5th.—Delete " farms ", and after " abroad " delete " especially from New Zealand and Australia."

7th line.—Delete (" farm as well as creamery butter ") and for " 25,000 " read " 50,000 ".

8th line.—For " X-1 " read " XI ".

11th line.—For " adulteratey " read " adulterated ".

Line 12.—For " counrd " read " country ".

In line 14.—For " by means of lime or other starter or a little " read " by means of a starter such as ".

Para. 10.

Lines 4 and 5.—For " raising the butter to a high temperature " read " boiling butter to a deep amber colour,".

6th and 7th lines.—Delete " although the primary producer may not resort to adulteration ".

Line 8th.—For " market " read " consumer ".

Para. 11.

For " condensed butter-milk " read " partially evaporated whole or separated milk ".

Para. 12.

Line 4.—Delete " which is ".

In last line.—After " fed to " add " calves and " and add from para. 6 beginning with " In certain......qualities " and add a new sentence reading " Arrangements have been made to investigate the possibility of using separated milk for making milk-powder ".

Para. 13.

(*b*) *Line 2.*—For " 25 " read " 125 ", and for " 580 " read " 680 ".

(*e*) *Line 2.*—For " uneconomic " read " primitive ".

Para. 14.

Line 10.—Delete " usually from hired cows ", and delete " So it is ....else to do ".

Para. 15.

6th and 7th lines.—For " The limiting factors are poverty and the lack of a wholesome supply particularly in cities." read " The limiting factor particularly in cities is the lack of a wholesome and cheap supply ".

8th line.—For " reasonable price " read " price within the purchasing capacity of the people."

In line 9 delete " without any propaganda for drinking more milk.".

Line 17.—For " their services are " read " breeding is ".

Lines 18 and 19.—Delete from " Usually there is...........either ", and read " the " as " The ".

Line 22.—For " Fatty degeneration " read " excess of fat."

(*b*) *Line 3rd.*—For " of about 700 " read " upto 600 ".

In (*e*), *1st line.*—For " ordinary " read " other ".

Page 9, line 12.—After " is " add " out of date and ", and in line 13 for " laxness " read " laxity ".

Para. 16.

1st line.—For " cast " read " cost " and delete " feeds ".

" P " of " Principal " should be small.

After item " (*d*) Depreciation or rent of buildings, etc., add " (*e*) " Interest on capital ", and (*f*) " Local taxes " after (*e*) in line 38.

Delete " In the case of butter........cost of butter-fat."

Line 12.—Delete " and about half of this is represented by fodder " and add " Village cattle are mainly fed on bye-products of agriculture which cannot be valued."

In (*b*) For " cows " read " animals ".

Page 10.—For top line read " place great importance on fodder production."

Page 11.—For 1st paragraph under the table read :

" It will be seen how even with uniform management, throughout India, the cost of production varies from place to place. Irrigated land is used for cultivated crop production. Such crops are cut and fed. Unirrigated land is usually under permanent indigenous grasses. Its fertility is maintained by fencing, bunding, harrowing and manuring. Some seasonal grazing is obtained but the most economic use of this type of land is for the production of silage and to a smaller extent hay."

Para. 17.—Delete " Labour cost......can be given." and for Cost of production from " read " Depreciation on ". Also in this connection read on page 58 in table I. item 3 for " Capital cost per lb. milk " " Cost per lb. milk on account of depreciation on stock."

Para. 18.—Delete " In the case of......pound of buttter."

Para. 19.—Retain only " It is estimated that 100 lbs. of butter yields about 78 lbs. of ghee."

Para. 20.—Under (*c*) for " or " read " and " and connect " discomfort " to " to " and continue upto " etc.", deleting " which are prevalent in certain seasons........calvings. This ", and begin fresh para. with " Distribution of calvings is uneven and is concentrated in........"

Line 31 and 32, upto " summer " should read " being fairly even. We may not be far wrong if we generalise that cows produce more milk in the first half of the year and buffaloes in the second half. During and immediately after ".

Para. 21.

Line 5.—For " box in which it is contained " read " container ".

In II—Marketing of Milk.—Put paragraph 38 on page 18 as 21 as the opening paragraph of the Section.

In *para. 22, line 4th,* for " partly dried butter milk " read " partially evaporated, whole or separated milk ".

Page 13. Line 5, after " fat " add " by middlemen " and delete " palm of his " and in *line 6* for " feeling the fat " read " to estimate the fat ".

Line 7.—Delete " It is said that " and " a " should be " A ".

Para. 23. Line 10.—For " inside large premises " read " in a milk market ".

Para. 24.—Delete " from the means of .... carried ", and in *line 5* delete " at times ". In *line 7* add " the distant " before " villages ", and after " marketing ", read " more use could be made of railway transport ".

Para. 25.—Add at the end " Such high cost of rearing would not be possible in ordinary commercial dairying. The average price of a first class cow in milk, reared under village conditions, is about Rs. 200 ".

Para. 26—Line 5th.—After " not " add " generally ", and delete " as ".

Para. 27—1st line.—For " many " read " some ".

Para. 29—line 6, delete " 200 to 400 a year ", and " Consequently there are many infertile services ", and read instead " This may have a bearing on the large percentage of infertile services which occur ".

Para. 30—1st line.—After " fed " add " owing to the peculiar conditions of the country ".

In the paragraph just above para. 31, line 3rd.—Before " scales " add " Ministry ".

Para. 31—1st line.—The heading should read " Wastage of Dairy Cows and Buffaloes in Cities ".

Line 2.—For " about 700 " read " up to 600 ".

Line 7.—After " practices " add " (Phooka) ".

Line 10.—After " slaughter " read " has led to depletion of the best dairy stock in certain areas " and after " cows " add " and buffaloes ".

Page 16, para. 34, add the following at the end

" There are, however, other natural fodder resources more use of which should be made ; for example natural grasses and certain edible shrubs and bushes.

To improve grazing and natural fodder resources the following measures are recommended :—

(*a*) Embankment of land (*Watbandi*),

(*b*) Encouragement of silage and hay-making,

(*c*) Control of the export of grass would be of great value to the village cattle-breeding industry,

(*d*) The collection of seeds from edible shrubs and bushes, for sowing on embankments or in their borrow pits, during the monsoon,

(*e*) To improve the water supply."

Page 18.

Para. 39 should read as

" The breeds of cattle that are generally recognised as dairy breeds are the Sahiwal, Sindhi, Tharparkar, Ongole, Gir cattle and Murrah buffaloes. All these have been systematically bred at one station or another.

" 39. *Sahiwal.*—Amongst the dairy breeds the Sahiwal has received the largest amount of attention. Special herds of cows of this breed selected for high yield have been bred and specially fed, notably at the Military Dairy Farm, Ferozepur, the Agricultural Institute, Pusa, and the Agricultural College Dairy, Lyallpur. The Ferozepur herd was started in 1912 or 1913 when the average over-all daily yield (computed over the milking and dry herds) was 4.6 lbs. In 1931-32 this rose to 17 lbs. which corresponds............under :

Page 19.—Top table

Insert " *strength of herd* " *each* year as 41, 32, 43.

Line 6.—Add " 51 " before " cows ".

Line 8.—Read " 118 " for " 17 " and check the figure.

Line 9.—Add " Of these " before " 66 ".

Line 11.—Add after " 4.7 ", " To reach these levels of production a large amount of culling has been necessary ".

Line 15.—Add " and " after " rearing ".

Para. 40—line 8.—Read " 1934-35 " for " 1924-35 ".

At the end of this para. add " Out of 248 lactations completed by the herd which existed in 1932, 34 exceeded 5,000 ; 8 exceeded 6,000, and 1 exceeded 7,000 lbs.

Para. 41—line 3.—Put full-stop after " breeding " and add the following sentence. " In *some cases cows are crossed with foreign* bulls. In others pure Sindhi bulls are used for improving indigenous cattle ". Obtain figures regarding Sindhi herds and Surti buffaloes from the Agricultural College Dairy, Kirkee, and also from the Wellingdon Dairy, Government House, Poona, regarding the Sindhi cows.

In the foot-note, delete first sentence and add " the " before " previous ".

Page 20—line 2.—After " Madras " add " at the Hosur Farm " and delete " (foundation herd) ".

Lines 3 and 4.—Delete " Corresponding..........3,564 ".

Para. 42—line 1.—Add " mainly " before " bred " and change " Ongole " for " Nellore ".

Lines 3 and 4.—Delete " Like the .... strains ".

Line 7.—For " had " read " has ".

Line 8.—Add " lbs. " after " 2,674 ".

Para. 43—line 1.—For " Kankraj " read " Kankrej ".

Line 2.—Put comma after " presidency " and read " the " for " The ".

Line 3.—After " farms " add " The Kankrej herd at Chharodi is bred under and maintained on semi-ranching conditions ". At the end, after " yield ", add " Some Gir cows have already given yields up to as high as 10,000 lbs. Kankrej cows have yielded as much as 6,000 lbs. in a lactation of 300 days ".

In the table put lbs. after figures.

Para. 44—line 1.—For " not " read " only ".

Line 2.—For " at any farm for " read " to a limited extent at farms of ".

In table under " Farm Bred " for " 133 " read " 122 " and under " Purchase " for " 286 " read " 268 ".

At the end of the page, add " At the Karnal Government Farm yields of as much as 8,000 lbs. have been obtained ".

Page 21.

Delete para. 45 *en masse.*

Para. 46—line 7.—Delete " and best ".

Line 8.—Add after " India " " At the former the present policy is to replace cross-bred animals by pure indigenous breeds ".

Line 9.—Read " Shorthorn " for " shorthorn ".

Line 11.—Add " The Military Dairies maintain a small pure Friesian herd at Sialkot in an attempt to produce stud-bulls for India " after " suitable ".

Line 18.—After " where " put " : ".

Line 19.—Put full stop after " adoption ", and " success " as " Success ".

Para. 47.

Line 2.—Delete " according to the Imperial Dairy Expert are breeds which " and add " may " before " have ".

Line 3.—For " Mahasana " read " Mehsana ".

Line 4.—For " buffs " read " buffaloes ".

In the table, delete " Siri (for hill dairying)..............(Bengal, Darjeeling) ", and put instead " Deoni (Hyderabad State) ".

The last four lines on the page should read :

Nagpuri Buffalo (Bombay and Berar).

Mehsana Buffalo (Baroda).

Surti Buffaloes (Gujerat).

Jaffarabad Buffalo (Kathiawar).

Nili Buffalo (Punjab).

Para. 48.

Line 1.—For " Economies " read " Economics ".

Lines 10, 11 and 12 upto " unfit ", should read " It is easier to improve buffaloes because there is not the same objection to slaughter ".

Line 14.—For " as well " read " also " and for " should therefore " read " therefore are ".

Para. 49.

Line 10.—For " Three " read " Two ".

Line 11.—Add " pure " before " breed ", and " and the " before " Barbari ". Delete " and Desi........Toggenbergs ".

Line 11.—Add " a " before " few ".

At the end of this para. before the table begins add " To some extent local goats have been graded up by crossing with the Toggenbergs ".

Correct spelling wherever it exists in text as " Barbari ".

At the bottom table, for " Average maximum daily yield " " Average daily yield at peak ".

Page 23.

Line 5.—Add " at the Etah Farm " before " is ".

Line 4.—Add " cows " after " Sahiwal ".

Line 8.—Delete " , if not almost nil ".

Para. 50—line 1.—For " Economies ", read " *Economics* ".

Para. 51.

Line 1.—Add " are " after " There ".

Lines 3 and 4.—Delete " Desi and Alwar " and add after " Kashmiri," " Malabar, Borri and Cutchi ".

Line 6.—For " Nutrian " read " Nubian ".

The word " Betul " should be spelt as " Beetal " wherever it exists in the text (line 12).

Line 15.—Delete " and the Punjab ".

Under *Barbari, line 1,* delete " size ".

Under " Surti " *line 1,* add " hornless " before " goat ", and in *line 3,* for " giving " read " give ".

The word " Desi " should be substituted for " local " wherever it exists in the text in paras. 49, 50 and 51.

The last line on page 23 beginning with " So called " and the first 3 lines on page 24, should be transferred to line 4 (para. 51) after " Cutchi ".

At the end of *page 23,* add

" *Malabar.*—Is a small-sized goat found along the Malabar Coast in the Madras Presidency, and is a good milker.

Borri.—These are goats with long hanging ears, mainly met with in Sind and Western, Punjab.

Cutchi.—These are large black goats with cork-screw horns, long black hair, and long white-speckled black ears. They are good milkers ".

Page 24.

Delete lines 4 and 5.

Para. 52.

Line 6.—For " 1932 " read " 1923 ".

Line 9.—For " Bangalore and Wellington " read " the Bangalore Farm and the Wellington Farm ".

Line 10.—For " transformed into institutions for the training of students " read " for training students ".

Line 33.—For " 2 " read " just over 2 ".

Line 39.—For " five " read " four ".

Line 41.—Delete " and training in co-operative dairying ", and add instead " The previous course of training in co-operative dairying has been discontinued.", and add " and " before " vocational ".

Page 25.

Line 7.—For " Nutrition " read " Physiological Chemist's ".

Line 8.—For " a " read " an enlarged ".

Line 10.—After " Research Institute " read " This will provide more space for the Bangalore Institute which is to be ".

Line 19.—For " IIIC " read " III ", and after that delete " In addition . . . . previous section." and read instead " A large amount of attention is paid to the development of dairying by the local Governments in different provinces ".

Para. 53.

Title should read " Work done by Provinces and States ".

Line 3.—For " crossing with . . . Scindi." read " grading up with recognised milk breeds ".

sub-paragraph (*d*) should read :

" (*d*) In certain provinces, *e.g.*, Madras, Bombay, Central Provinces, United Provinces, and the Punjab, dairy training forms a part of the syllabus for the B.Sc. or B.Ag. degrees in Agriculture. Instruction is also given at the different veterinary colleges in India in Milk Hygiene ".

Under (*f*), for " Bombay " read " the Bombay Presidency ".

Page 26.

Line 3.—Add " , Chintaladevi " after " Farm ".

Line 4.—Add " , Guntur " after " Station ".

Line 9.—Add " , Coimbatore " after " Dairy ".

Line 11.—Add " but a small herd of Hallikar cattle has recently been added ".

Line 13.—Delete " cow ".

Page 27.

Lines 10 and 11.—For " Tests are . . . requirements " read " Work is being done on mineral deficiency and fodder production ".

Line 13.—For " different stations :—" read " Government Farms and in breeding areas :—".

Line 18.—For " Malbi " read " Malvi bulls ".

Line 19.—For " Kheda " read " Khera ".

Line 21.—For " Telaukheri " read " Telankheri ".

Line 28.—For " however " read " also ".

Line 34.—For " Researches are " read " Research is ".

Page 28.

Line 2.—For " , in the Rohtak Hissar area." read " from the Punjab and elsewhere ".

Line 8.—For " Hissar " read " Sahiwal " and for " Poriwar " read " Ponwar cattle ".

Line 9.—Delete " , besides a few . . . animals ".

Lines 10 and 11.—Delete " care being . . . stock ".

Line 13.—Delete " Central humid " and for " tract " read " tracts ".

Line 15.—For " as a result of which a " read " and a more ".

Line 16.—Add " being " before " taught ".

Line 22.—Add " approximately " before " 40,000 ".

Line 23.—Add " one of " before " the largest ".

Line 24.—Delete " on payment " and instead read " at concession rates " and in line 23 delete " of the Hariana breed ".

Line 28.—For " Betul " read " Beetal ".

Lines 29 and 30.—Delete " These goats . . . so big ".

Line 31.—Add " To supplement the work of the Hissar Farm ' before " grading up ".

Line 32.—Add " five " before " Grantee " and instead of " Mont gomery area " read " Lower Bari Doab Canal Colony Area ".

Line 33.—For " 16,267 " read " approximately 14,000 " and delet " on the conditions that a certain number of bulls will be supplied ever year for breeding purposes ".

Line 36.—Add " Valuable work is being done in the grading up o Sahiwal cattle at the Punjab Agricultural College, Lyallpur ".

Line 26.—Add after " separately " " Stud bulls are issued at the rat of approximately 600 a year ".

Line 42.—For " Dajil and Hariana cattle breeding areas " read " Dajal, Hariana, Montgomery and Malwa breeding tracts ".

Line 45.—For " cows " read "cattle ".

Page 29.

Lines 1 and 2.—Delete " as has been mentioned above,".

Lines 12 and 13.—Delete " Ten years . . . producers, Now ".

Line 14.—Add " buffalo " after " Nili ".

Line 15.—Add after " cattle." " and promising results are being obtained ".

Line 18.—For " machinery at important " read " appliances at suitable ".

The first paragraph under Bihar and Orissa should be deleted upto " collected ".

Under Ranchi.—Delete " Pedigree " before " Tharparkar " and add " cattle " after " Tharparkar ".

Under Sabour and Patna.—For " desi " read " local " and for " pure bred Tharparkar herd." read " pure herd.".

In the paragraph above Assam read " Department of Agriculture " in place of " Agriculture Department ".

Page 30.

Line 6.—Delete " other than approved breeding bulls ".

Line 7.—For " taxed " read " charged ".

Line 10.—For " kinds " read " branches ".

Line 28.—Delete " by crossing them with Scindi or Ongole ".

Line 31.—For " Scindi " read " bred ".

Line 41.—Add " veterinary " before " hospitals " and for " Agriculture " read " agricultural ".

Page 31.

Line 4.—For " Demand " read " demand ".

Line 5.—For " constant " read " increasing ".

Line 7.—Add after " yield." " Similar work is being done at the Himayat Sagar Model Dairy Farm where Krishna Valley and Malvi cattle are maintained ".

Delete pages 84, 85, 86, 87 88, 89, 90, 91.

Page 33.—Delete " Provisional " and transpose " 11, 12, 13 " for " 8, 9, 10 ".

Page 92.

Delete " Appendix J " and all matter in the last 10 lines.

Delete pages 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 105, 106, 107, 108.

Page 42.—Add " per lb." after " Prices of Milk, Ghee and Butter ".

Page 50.—In foot-note for " marked " read " masked ".

Page 71.—For figure " 9,179 " in the table, read " 5,179 ".

Page 74.

Line 2.—For " Appendix G " read " Annexure I ".

Lines 4 and 5.—For " Appendix H " read " Annexure II ".

Lines 9 and 10.—Delete " These reports . . . . as also " and for " Appendix I " read " is given in Annexures IV and VI ".

Delete foot-note.

Page 75.—For " Appendix " read " Annexure I ".

Page 78.—For " Appendix " read " Annexure I ".

Page 79.—For " Appendix H " read " Annexure II ".

Page 81.—For " Appendix I " read " Annexure III ".

Page 83.—For " Appendix J " read " Annexure IV ".

Page 92.—For " Appendix J " read " Annexure V ".

Page 100.—For " Appendix J " read " Annexure VI ".

APPENDIX IV.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 26th May 1936, on Subject No. 7 :—Application from the Government of Bombay for a grant of Rs. 41,075, spread over five years for a scheme of research in economic ornithology by Mr. A. Salim Ali.

Reference is invited to the notes on this subject circulated to the Advisory Board at its meeting held in February 1936 (*vide* pages 95—126 of the printed proceedings). The Board approved the scheme in principle but referred it to a Special Committee of Entomologists and subsequently decided that it should again be considered by the Board at its next meeting (Annexure I). Relevant extracts from the report of the second meeting of the Committee (Annexure II) were circulated to the Board.

2. The subject is now for further consideration by the Board.

ANNEXURE I.

EXTRACT FROM THE PROCEEDINGS OF THE MEETING OF THE ADVISORY BOARD OF THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, HELD AT NEW DELHI, ON MONDAY, THE 10TH FEBRUARY 1936.

10. *Scheme for research in Economic Ornithology at a cost of Rs. 41,075 spread over a period of five years submitted by Mr. Salim Ali through the Government of Bombay (Subject No. 5).*

The Vice-Chairman referred to the discussion at a previous meeting and to the papers before the Board. A Committee had not been appointed because three local Governments had definitely opposed the Council spending money on the scheme. There were also several criticisms as to the method of work proposed.

Dr. Burns pointed out that this scheme was put up by a private individual who had chosen Bombay as the venue for the work, because they were able to give him certain accommodation and facilitate his researches at Poona. The man, Mr. Salim Ali, was an expert in a rather specialised subject and he asked for help having had considerable amount of training both in Europe and India. Dr. Burns said that this scheme had much greater reasons for support than many schemes which had already been supported. The criticism had been made that more important work was held in abeyance for lack of funds, but he pointed out that the importance of the work and not the financial question was what the Board was concerned with. There were no doubts about the ravages of birds on crops and their undoubted services in other directions. The Council gave its grants on some definite principle, he presumed, and this question was of considerable direct importance to agriculture.

There were two ways in which this scheme could be worked, *viz.*, (1) as an all-India scheme and (2) as a small scheme worked by an individual.

Dr. Burns was in favour of the latter. The Vice-Chairman first asked the Board to consider the general question whether the Council should finance research on this subject.

Mr. Kerr asked whether a Committee could say if the proposed work was of sufficient importance.

Dr. Shaw enquired whether the Provincial Government was contributing towards the scheme. The Vice-Chairman explained that the scheme was receiving no financial support from the Provincial Government. It was proposed that as a highly trained worker was available to carry out the work, the Council should give assistance to this investigation on Economic Ornithology.

On being put to the vote this motion was carried by a large majority.

The Vice-Chairman pointed out that the scheme would be too expensive to carry out on an all-India scale, and suggested that the scheme be now referred to the Entomological Committee for discussion of details. This suggestion was approved by the Board.

EXTRACT FROM THE PROCEEDINGS OF THE MEETING OF THE ADVISORY BOARD OF THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH HELD AT NEW DELHI, ON SATURDAY, THE 15TH FEBRUARY 1936.

12. *Scheme for research in Economic Ornithology at a cost of Rs. 41,075 spread over a period of five years submitted by Mr. Salim Ali through the Government of Bombay (item No. 5 of the Agenda).*

Dr. Shaw said that as many members of the Entomological Committee had only reached Delhi on the day of the meeting and had only received the scheme at the meeting, the committee had not been able to give sufficient examination to the scheme to express an opinion. It was decided that the matter should be discussed again at the meeting of the Entomologists Committee that afternoon and the scheme brought before the next meeting of the Board. If necessary an *ad hoc* Committee would then be appointed.

ANNEXURE II.

EXTRACT FROM THE REPORT OF THE ENTOMOLOGISTS COMMITTEE, MET ON THE 15TH FEBRUARY 1936.

Scheme for research in Economic Ornithology at a cost of Rs. 41,075 spread over a period of five years submitted by Mr. Salim Ali through the Government of Bombay (item 5 of Agenda).

This subject had been approved in principle by Advisory Board and the Committee considered that

(1) an Economic Field Ornithologist on the scale of pay Rs. 200—15—600, initial pay not to exceed Rs. 260, was required for this scheme ;

(2) a laboratory boy and contingencies making up a total of Rs. 500 would be required.

The Committee concluded that the qualifications of the Economic Field Ornithologist were a sound knowledge and experience in field ornithology and that academic degrees were not in this case necessary.

The Committee also concluded that the most suitable institute to which the Economic Ornithologist should be attached is the Imperial Institute of Agricultural Research, Delhi, or the Agricultural Institute, Lyallpur.

APPENDIX V.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 11th July 1936, on Subject No. 8-A (i—xiv) :—Progress Reports on Sugar Schemes.

With reference to the progress reports on sugar schemes already circulated to the Board (not printed), the following papers are now circulated :—

(*i*) Report of the sub-committee of the Sugar Committee which examined these reports (Annexure I).

(*ii*) Extract from the proceedings of the Sugar Committee (Annexure II).

ANNEXURE I.

EXTRACT FROM THE PROCEEDINGS OF THE SUGAR COMMITTEE MEETING, HELD ON JULY 1936.

Progress report on the working of the Sugarcane research station in the Bombay-Deccan, Padegaon, for 1934-35.

In introducing the subject, Dr. Shaw said that the report submitted was rather long and such reports in future should follow the lines laid down by the sub-committee. Subject to the notes put in by the sub-committee, they recommended the approval of the report. The sub-committee's recommendations were adopted unanimously.

Progress reports on the Sugarcane Seedling Testing Station at Dacca for 1934-35.

In introducing the subject, Dr. Shaw said that these reports referred to the Seedling Testing Station at Dacca. He said that the sub-committee deprecated the breeding of canes at the station and that Mr. Carbery had accepted the suggestion. Subject to that criticism, the report was recommended for adoption. The sub-committee's report was adopted unanimously, but it was emphasised that the criticisms made by the sub-committee should be carefully noted for future guidance.

Progress report of the Sugarcane Research Scheme in the United Provinces (Shahjahanpur and Muzaffarnagar) for 1934-35.

Dr. Shaw explained the recommendations of the sub-committee and recommended the adoption of the report.

Lala Hari Raj Swarup enquired whether the suggestion that he had made last year regarding the publication of results of research in the form of bulletins for the benefit of the cultivator and factory-owner had been carried out.

Mr. Richards said that useful results had been written up for departmental use and issue to the public. The pamphlets were either in the press or going to be shortly issued.

Mr. Sherwani suggested that different provinces should be requested to publish the results as soon as possible.

Mr. Allan said that a long bulletin on sugarcane prepared by Mr. R. L. Sethi was in the press. He also said that the monthly statement of a popular nature had been prepared by the Department of Agriculture in the United Provinces.

The Chairman undertook to consider the suggestion. He hoped that if the Committee so desired, it would perhaps be possible this year to issue a summary of the practical results accrued from the various researches carried out under the auspices of the Council.

The progress report was then adopted.

Progress report on the work of the Sugarcane Research Station at Mushari (Bihar and Orissa) for 1934-35 and 1935-36.

Dr. Shaw, in introducing the subject, said that the Committee noted that the programme of work in the latest report, 1935-36, was the same as the revised programme of work for the renewal of the scheme. The sub-committee therefore considered this programme of work in some detail and their detailed recommendations were to be found on pages 3 and 4 of the report of the sub-committee. The sub-committee considered that the breeding of new varieties in Bihar should not be carried out, as this particular station had not the facilities for this kind of work and involved the duplication of work which was being done at Coimbatore. With this modification the sub-committee recommended the report for adoption.

Mr. D. R. Sethi, the Director of Agriculture, Bihar, accepted the recommendations of the sub-committee. The report was then adopted by the Committee.

Mr. Haji Abdulla Haroon wanted the reports of the Research Station to be distributed to the factory owners in the province concerned.

The Chairman promised to consider the suggestion. Sir Sundar Singh Majithia said that it would be better to distribute the summaries of these reports rather than the report.

Progress report on sugarcane work at the Jorhat Experiment Station, Assam, during 1934-35.

In introducing the subject, Dr. Shaw explained that the sub-committee made some adverse criticisms on this report. The sub-committee noted that the staff consisted of a Farm Manager in the grade of Rs. 60 to 120 and a Chemical Assistant in the same grade. The sub-committee, on looking into the report, came to the conclusion that the work which was to be conducted under the scheme was rather beyond the capabilities of the staff. The sub-committee recommended that the scheme should be inspected by a senior officer of the Assam Department and a detailed programme of work for 1936-37 should immediately be submitted to the Council. The sub-committee considered that a more highly qualified Assistant should be placed in charge of this scheme.

The recommendations of the sub-committee were adopted.

Report of work done on the breeding of thick canes in Mysore at the Hebbal Farm, Bangalore, and Irwin Canal Farm, Mandya for 1933-35.

Dr. Shaw introduced the report of the sub-committee and said that the sub-committee considered that the number of replications was not sufficient and that full details of the statistical analysis should be furnished

at least in one case. The data supplied at present were insufficient to enable the Committee to judge the results obtained. The sub-committee particularly commended the experiments on induced mutation of canes by X-ray treatment. Subject to the comments of the sub-committee the Mysore report was recommended for adoption. It was observed that very encouraging results had been obtained from the scheme as a result of the X-ray treatment of cane. Dr. Narasimha Iyengar participated in the discussion and accepted the recommendations of the sub-committee. The sub-committee's report was then unanimously adopted.

Subsequent to the adoption of the report Lala Shri Ram enquired, apart from the merits of the case, what the policy regardnig the financing of research schemes in Indian States was going to be, especially as the States retained the excise duty collected within their own jurisdiction. The Vice-Chairman said that grants were only given to the constituent States which contributed to the funds of the Council. The Mysore State, for instance, had given a donation of rupees one lakh to the Council when it became a member. Besides, the Council was induced to finance the scheme as Bangalore had special facilities for the breeding of thick canes. He added that the Imperial Council of Agricultural Research did not finance schemes in Indian States which were not members of the Council.

Mr. Narang enquired what the benefits to British India were from financing such schemes in Mysore ? The Vice-Chairman said that the results would be available to British India even prior to the present scheme as selected canes from Hebbal had proved very useful in the Bombay Presidency.

Reports on the work done under the scheme for research on the genetics of sugarcane from May 1934 to July 1935, and from July 1935 to March 1936.

The report of the sub-committee was introduced by Dr. Shaw. He said that cytological research was long range research and was not expected to yield results of economic value in a short period. This was fundamental research on the principle of cane-breeding. The Committee, however, thought that very satisfactory progress had been made under the supervision of Rao Bahadur T. S. Venkataraman. Rao Bahadur Venkataraman said that the position had been accurately summarised by Dr. Shaw. The sub-committee's report was then unanimously adopted.

Annual report of the sugarcane research scheme in the Punjab for 1934-35 and 1935-36.

The Committee approved of the report on the progress of work and suggested that the lay-out and irrigation data as well as those regarding rotation should be given in the annual report. The sub-committee's report was then adopted without comment.

Report of the Sugarcane Sub-Station, Karnal, 1935-36.

Dr. Shaw said that the Karnal Sub-Station had adequately fulfilled its purpose in testing canes for Northern India. He suggested that periodic sugar values of all canes should be given in all reports not only for Karnal but also for other sub-stations.

Rao Bahadur Venkataraman said that the data about the periodic sugar value of cane at different times were required, for such data were of value to the sugar manufacturer in fixing the proper time for cutting the cane. These periodic analyses were therefore very useful and should be included in the reports in future. The report was then unanimously adopted.

Progress report on investigations on the mosaic and other diseases of sugarcane for 1934-35.

The Committee approved the report.

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ANNEXURE II.

REPORT OF THE PROGRESS REPORTS SUB-COMMITTEE HELD AT ROCK HOUSE AT 2-30 P.M. ON 8TH JULY 1936.

* * * * * * *

Progress report on the working of the Sugarcane Research Station in the Bombay-Deccan, 1934-35.

The Committee recommend that the portion of the report dealing with Sugarcane should follow the form laid down by the Council. The Committee would call the attention of the Sugarcane Entomologist at the Imperial Agricultural Research Institute to the statements regarding the incidence of cane borer at page 20. The Statistician to the Council explained to the Agricultural Officer, Padegaon, the statistical points relating to this Report which are dealt with in his note.

Subject to the above remarks, the Committee approved of the Report.

Progress Reports on Sugarcane Seedling Testing Station at Dacca for 1934-35.

The Committee note that a number of seedlings were raised from seed produced at the Dacca Farm. Mr. Carbery explained that this was a very small piece of work and not in any way an attempt to embark on a scheme of cane-breeding at Dacca. The Committee approved of the Report and considered that excellent results had been obtained in relation to the cost of the scheme. The size of samples on which statistical statements are based should be indicated in the report.

Progress report on the Sugarcane Research Scheme in the United Provinces (Shahjahanpur and Muzaffarnagar) for 1934-35.

The Committee noted the statement on page 6 that Co. 213 was deteriorating all over the United Provinces but considered that it was not clear whether this deterioration was due to the incidence of disease, bad climate, inferior cultivation or to an actual decline in the quality of the cane itself. Mr. Sethi explained that the information that Co. 213 had deteriorated was based on factory reports and was not on observation by officers of the Department of Agriculture, United Provinces.

The Committee approved of the Report and noted that it contained not only the work of the scheme financed by the Imperial Council of Agricultural Research but also that of the Provincial Department financed by the Local Government.

Progress Reports on the work of the Sugarcane Research Station at Mushari (Bihar and Orissa) for 1934-35, and 1935-36.

The Committee considered the programme of work at page 17 of the 1935-36 report and noted that this programme was the same as that in the application for the extension of the scheme. The Committee therefore considered both programmes together and made the following recommendations :—

Agronomical.

(*a*) *Varietal.*—The Committee considered that the varietal programme was quite satisfactory except that of breeding new varieties at the station. This work should be omitted as it was unnecessary duplication of the Coimbatore work. There was no point in carrying out this work extensively in Bihar, as, besides sets, Coimbatore now sent out seedlings and that should give enough material to the research stations for selecting their suitable types. Except for this item, the rest of 4 items under 'varietal' might stand. On more than one occasion emphasis had been laid on the extreme improbability of obtaining seedling canes better than the Coimbatore series unless very large numbers were handled—for this Mushari had not the equipment or facilities.

(*b*) *Manurial.*—These investigations should give very useful results and might be continued. Advantage should be taken of the researches already carried out in this direction by Mr. A. P. Cliff, Deputy Director of Agriculture, North Bihar, who had recently published a note on sugarcane cultivation in that tract. Duplication of work should be avoided.

The Committee noted that item No. 4 under 'manurial' was being discontinued after this year and consider that this is the correct policy as such an experiment is unlikely to yield definite results without a water recorder and *pucca* channels.

Page 18, item (c).—Irrigation.

Mr. D. R. Sethi explained that the object of these experiments was to demonstrate the value of irrigation during stress periods in the hot weather in North Bihar and considering the facilities available at the new site of the cane station at Pusa, the Committee approved of this item.

II.—Botanical and Physiological.

Mr. D. R. Sethi explained that the root studies proposed were to be carried out only at the main station and at the sub-station and in view of this work being restricted to two stations, the Committee approved of this item in the programme.

The Committee would like to emphasize that the refractometer studies are important and should be continued. Subject to the above remarks the report and the programme was approved.

Subject to these criticisms the Committee approved of the programme of work and the Report.

Progress Report on sugarcane work at the Jorhat Experiment Station, Assam, during 1934-35.

The Committee consider that the work which is being conducted in this scheme is beyond the capabilities of the staff of the research station. The Committee note that in the case of manurial experiments on pages 4 and 5 of the report two different manures are each tried with two different canes and that there is no common factor which enables the results to be co-ordinated. The whole plan of the experiments is open to criticism as there is no standard cane included in varietal trials. The Committee would suggest that the Council call immediately for the detailed programme of work proposed for 1936-37 and that a responsible officer should inspect the station at an early date. A more highly qualified Assistant-in-Charge of the scheme is required.

Report of work done on the breeding of thick canes in Mysore at the Hebbal Farm, Bangalore, and Irwin Canal Farm, Mandya, for 1933-35.

Varietal tests.—The Committee consider that the number of replications is insufficient and the full details of statistical analyses should be given. The present data is insufficient to enable the Committee to evaluate the experiment. The Committee desire to commend particularly the work in producing mutations by X-rays and hope that it will yield results of economic importance. The Committee note with interest the attempt to control borers by improved methods of earthing up and trust that these experiments will be continued.

The Committee approved of the report.

Reports of the Sugarcane Geneticist.

The Committee approved of the reports and considered that satisfactory progress was being made.

Annual report of the sugarcane research scheme in the Punjab for 1934-35 and 1935-36.

The Committee consider that the lay out and further details of the irrigation experiment described at page 5, section (*b*) should be given in the report. In the programme of work under 3 (*a*), the data for rotation crops should also be provided.

The Committee approved of the report and the programme of work for 1936-37.

Report of the Sugarcane Sub-Station, Karnal, 1935-36.

The Committee considered that the sub-station was fulfilling its duties in the work of testing canes suitable for North Indian conditions. The Committee would like to see in all reports periodic sugar values of the varieties in the final test as in the case of Karnal.

Progress report on investigations on the mosaic and other diseases of sugarcane for 1934-35.

The sub-committee's report was adopted.

APPENDIX VI.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 11th July 1936, on Subject No. 8-B :—(i) Review of the quality of sugar manufactured in India by central sugar factories and refineries during the season 1935-36.

(ii) Report on the working of the Bureau of Sugar Standards for 1935-36.

A copy of a Report by the Sugar Technologist, on the working of the Bureau of Sugar Standards for 1935-36 (not printed) together with a copy of a report of a Sub-Committee of the Sugar Committee (Annexure) which examined the report [and the Review referred to as item 8-B (*i*)], is attached. The Sugar Committee adopted the Sub-Committee's report.

The Review referred to as item 8-B (*i*) (not printed) will be circulated to the Board separately.

ANNEXURE.

REPORT OF THE SUB-COMMITTEE OF THE SUGAR COMMITTEE FOR CONSIDERATION OF ITEMS 11 AND 24 ON THE AGENDA OF THE SUGAR COMMITTEE [ITEMS NOS. 8-B (*i*) AND (*ii*) ON THE AGENDA OF THE ADVISORY BOARD.]

PRESENT :

1. Sir BRYCE BURT, *Chairman*,
2. Haji ABDOOLA HAROON,
3. Lala SHRI RAM,
4. Lala HARI RAJ SWARUP,
5. Mr. DES RAJ NARANG,
6. Mr. F. A. SHERWANI,
7. Chaudhri MUKHTAR SINGH,
8. Mr. R. C. SRIVASTAVA.

Item 24.—Publication of some of the consolidated statements issued under the Sugar Production Rules, 1935.

It was explained that the principle hitherto followed in connection with the publication of the consolidated statements under the Sugar Production Rules was to supply the information primarily to the factories. In view of the demand for more publicity it was agreed that the following statements should be published in the Indian Trade Journal and reprints of these should be supplied to all the factories :—

(1) Consolidated statements of (*i*) the total price paid for cane, and (*ii*) the portion thereof actually received by the grower from " Central Sugar Factories ".*

(2) Central Sugar Factories—Consolidated Monthly Statement of Sugar Production and Stocks.

If there are any ambiguities in the consolidated statements, these should be made clear by means of explanatory foot-notes.

The information required for compiling the consolidated statement of Sugar Production and Stocks should in future be called for fortnightly and the consolidated statement should be published fortnightly and promptly. It was suggested that stringent measures may be taken against factories which failed to supply returns promptly. The Sugar Technologist was asked to send names of defaulting factories to the Vice-Chairman to enable him to take necessary action.

As regards the consolidated statement of monthly manufacturing data, the supply of these should be limited to factories only.

It was decided to continue the present rules and forms during the next season also excepting for any minor changes which may be found to be necessary.

Item 11.—Review of the quality of sugar manufactured in India by Central Sugar Factories and Refineries during the season 1935-36.

Item 11-A.—Report on the working of the Bureau of Sugar Standards for 1935-36.

The Sub-Committee agreed to make the following recommendation :—

(1) The sugar production in India has now reached a level where orderly marketing is essential.

(2) In order to secure orderly marketing, it is necessary that all future sales should be based on a recognised set of Indian Sugar Standards, such as that which the Imperial Council of Agricultural Research has had prepared.

(3) To make this effective, it is necessary to set up an All-India Sugar Association, similar to the East India Cotton Association with statutory recognition and powers.

(4) Forward sales of sugar except on the basis of recognised standards should be prohibited by law.

The Sub-Committee accepted the suggestion that the manufacturers should be required by law to stamp on all sugar bags the quality of the sugar in terms of the Indian Sugar Standards before sale can be made.

It should be the aim to reduce the number of standard qualities of sugar produced for marketing.

The Sub-Committee agreed that the Agricultural Marketing Adviser be asked to prepare in consultation with the Sugar Technologist, a skeleton scheme for the proposed All-India Sugar Association on similar lines to the East India Cotton Association. This should be circulated to all the sugar manufacturers Associations and also to suitable associations of sugar merchants and traders and those individuals, who can be of assistance in the criticism of the scheme.

APPENDIX VI-A.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 11th July 1936, on Subject No. 8-B (iii) :—Report on the utilisation of bagasse for the paper and board industry by Mr. M. P. Bhargava, Officer-in-charge, Paper Pulp Section, Forest Research Institute, Dehra Dun. (Grant recommended Rs. 15,000.)

A copy of a note, dated the 4th April 1936 (Annexure I) circulated to the Committee, together with relevant extracts from the proceedings of the Committee thereon (Annexure II), is attached. The Committee has recommended the grant of Rs. 15,000 to the Forest Research Institute, Dehra Dun, for carrying out experiments on the subject, if facilities are provided at the Institute.

2. The subject is for the consideration of the Advisory Board.

ANNEXURE I.

NOTE BY THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, DATED THE 4TH APRIL 1936, ON SUBJECT NO. 15 OF THE AGENDA OF THE SUGAR COMMITTEE, JULY 1936. REPORT ON THE UTILISATION OF BAGASSE FOR THE PAPER AND BOARD INDUSTRY BY MR. M. P. BHARGAVA, OFFICE-IN-CHARGE, PAPER PULP SECTION, FOREST RESEARCH INSTITUTE, DEHRA DUN.

At its meeting held in November 1933, the Sugar Committee considered a note on the utilisation of bagasse for paper and board industry by Mr. Bhargava and recommended that the Forest Research Institute should be requested to undertake more extended experiments in the manufacture of paper, etc., from sugarcane bagasse (*vide* pages 33 and 149 of the printed proceedings). The President, Forest Research Institute, was accordingly requested to conduct further experiments and a copy of his report is attached (Enclosure I). The comments of the Sugar Technologist, Imperial Council of Agricultural Research, on the report and a further note by Mr. Bhargava on the Sugar Technologist's comments, will be found in Enclosures II and III. The samples of the board and paper actually prepared at the Forest Research Institute will be available to the Committee for examination at the meeting.

ENCLOSURE I.

Report on the Utilisation of bagasse for the paper and board industries.

We carried out a few tests in the factory on bagasse supplied to us by Messrs. Begg, Sutherland & Co., Ltd., Cawnpore. The unbleached yield on the raw material was 50 per cent. This is quite good and bears out the statement made in letter No. F. 316|33|A., dated the 19th March 1934 from the Imperial Council of Agricultural Research, *viz.* "The improved canes now grown in Northern India have a relatively high fibre content". Packing and cheap *badami* papers were made from the unbleached pulp. In the latter case about 25 per cent bamboo pulp was mixed with the bagasse pulp. Samples of packing and *badami* papers are submitted herewith. In factories, equipped with suitable machinery

for manufacturing such papers it should be possible to turn out much better products than these. Experiments were also made in the laboratory to produce boards from bagasse. Small samples of boards, for insulation, structural purposes, etc., made by hand are also submitted herewith. These show that the material appears to be quite suitable for the production of such boards. We are, however, not equipped at this Institute for making boards on a semi-commercial scale. Samples of boards and papers, made from Bagasse, were given to the Sugar Technologist, Cawnpore, in January last.

The unbleached pulp from bagasse was also bleached in the laboratory. It was found that it required 9 per cent standard bleaching powder and the yield of bleached pulp was about 41 per cent. The bleach consumption is about 50 per cent higher than that required by such grasses as *sabai (bhabar)*, *ulla*, etc., but compares favourably with that required on the average by bamboos. The average length of the fibre of the material experimented upon was found to be 2 mm., there being a large number of shorter fibres. In this respect the material compares unfavourably with bamboos or *sabai* grass, etc.

Considering the above data, the material does not appear to be unsuitable for the manufacture of products like boards, packing and wrapping papers and even certain classes of writing and printing papers in admixture with longer fibred pulps, *e.g.*, bamboo, rags, etc. The possibility however, of utilising the material for such products depends, firstly on the quantities available and secondly on the price at which it can be made available at the manufacturing site. If the quantities available are only such as are surplus in the most efficient sugar factories (please see paragraph 2 in the Imperial Council's letter referred to above), then the supply of the raw material is likely to be unreliable and also the total quantity available will probably not be large enough to justify putting up a paper or a board factory. According to the Sugar Technologist, Cawnpore, the cost of 1 ton of bagasse *at the sugar factory* is likely to be between Rs. 12 and Rs. 14, on the assumption that wood for fuel will cost between Rs. 6 and Rs. 7 per ton. To the above cost of bagasse, the cost of transporting it from the sugar factory to the paper or board factory has to be added. At this cost, which may be anything from Rs. 14 to Rs. 18, or more, per ton, it appears doubtful whether the utilisation of bagasse for paper or board will be more economic than using grasses or bamboos for the purpose. If, however, the price of bagasse is low and adequate quantities of it are available, there appears to be nothing against its utilisation for board or paper manufacture. For instance, in February last, Messrs. The North Bengal Sugar Mills Co., Ltd., Goralpur, District Rajshahi, informed us that about 12,000 tons of bagasse could be made available at their factory at about Rs. 7 per ton and that bamboos were also available in the vicinity. In such cases the utilization of bagasse for paper or board manufacture appears to be feasible provided the bagasse is not of poor fibre content and other manufacturing facilities are available.

To sum up, bagasse is a raw material which may be used for paper or board manufacture. Each project for its utilisation for the purpose, however, requires to be investigated on its own merits.

ENCLOSURE II.

A Note on the Utilisation of bagasse for the Paper and Board Industries, by Mr. R. C. Srivastava, B.Sc., Sugar Technologist, Imperial Council of Agricultural Research.

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1. *Imports of Packing Paper and Boards of all kinds into India.*

The statement given below shows the quantities and values of packing paper and pasteboard, millboard and cardboard of all kinds imported into India during 1932-35.

Imports.	Quantity. Cwts.			Value. Rs.		
	1932-33.	1933-34.	1934-35.	1932-33.	1933-34.	1934-35.
1. Packing Paper ..	324,897	250,268	313,478	45,35,100	31,81,847	38,17,714
2. Total of pasteboard, millboard and cardboard of all kinds.	419,543	317,042	416,954	37,14,212	27,72,684	33,38,714

These figures give an indication of the potential market for Indian made packing paper and Board in India.

2. *Paper and Board from Bagasse.*

Large quantities of Board for insulation and structural purposes, are already being manufactured in Louisiana and other countries. Special mention may, however, be made of the Celotex Co. in Louisiana. The suitability of bagasse for the above purposes depends to a considerable extent on the quality of fibre present in it. The experiments conducted at the Forest Research Institute, Dehra Dun, with Indian bagasse, have removed all doubts regarding the suitability of Indian bagasse for paper and board manufacture. The only important defect in Indian bagasse, however, appears to be the short length of its fibres. This is also a point which affects the milling quality of the cane. Hence it is desirable to raise varieties of canes which have fibres of sufficient length to meet the requirements of milling, as well as board and paper making. The admixture of Bamboo Pulp can then be given up.

3. *Price of Bagasse.*

Bagasse is at present being used as fuel in factories. If some bagasse is saved by factories this may find use for raising power during the off-season. If bagasse is to be made available for other purposes, it will be necessary to replace it by other fuel like wood or coal. Thus the cost

of bagasse at any factory will depend on the cost of wood or coal obtainable at the factory and also on such additional equipment or changes in existing steam-raising plant, as may be necessary.

(a) Wood as a substitute for Bagasse.

Wood as a substitute for bagasse has the advantage that it can be burnt in bagasse furnaces, either by itself, or in admixture with bagasse. But the price for the same fuel value is likely to be high. The calorific value of dry bagasse may be taken as 8100-8350 B.T.U., whilst that of wood is 4500 to 5000 B.T.U. On the basis of these fuel values, therefore, the selling price of Bagasse, when wood is used as a substitute, may be taken at nearly twice the price of wood delivered at the factory. If the ex-factory price of wood is Rs. to Rs. 7 per ton (which is a comparatively low figure for most parts of the United Provinces and Bihar and Orissa) the price of bagasse will come to Rs. 12 to Rs. 14 per ton.

(b) Coal as a substitute for bagasse.

Coal, unless much cheaper than wood, is not a very desirable substitute for bagasse as it is difficult to burn it in bagasse boilers, even when they are fitted with auxiliary coal furnaces. To get the maximum heat value from coal, separate boilers will have to be installed. This will be a costly addition and factories may not be willing to undertake it unless they are assured that their bagasse will be sold for several years.

The calorific value of bagasse is about two-third that of coal, so that the price of bagasse when coal is used as a substitute, may be estimated to be about equal to the value of coal at the factory, in view of the changes in equipment that may be necessary.

The average price of coal at the collieries in Bengal, at present is about Rs. 3 a ton. To this will have to be added the transport charges from the colliery to the factory.

(c) Other factors affecting the price of Bagasse.

The prices of bagasse calculated above relate to loose bagasse *ex* sugar factory. To obtain the price of bagasse at the Board factory the following additional expenses will have to be included.

(i) *Baling, Storage and Handling Charges.*—Baling of bagasse for transport is a very important item and for this separate equipment and staff will be necessary at each purchasing centre. The number of such centres will depend on the number of factories from which the supplies are drawn.

(ii) *The transport of bagasse.*—The freight on bagasse as well as other transportation charges from the sugar factory to the Board factory will also have to be taken into account.

After allowing for all the above items, the cost of dry bagasse delivered at the Celotex Co. in Louisiana is about Rs. 9 per ton. It may be possible to get bagasse at this rate in the case of a Board factory situated in parts of Bihar and Orissa and Bengal close to the collieries, if coal is available at a low price provided coal-burning boilers are installed in sugar factories.

IV. *Estimated Quantity of Bagasse Available.*

It is true that " The improved canes now grown in North India have a relatively high fibre content ". They are in fact amongst the most fibrous canes in the world. All the same the reports received from most of the factories in India show, that at present almost all of them are using varying quantities of extra fuel. Fuel consumption and steam economy has not reached a sufficiently high standard of efficiency in Indian factories to permit of bagasse being saved. At present therefore, bagasse can be made available for paper and board manufacture only by replacing it with wood or coal. But wood is a comparatively costlier substitute than coal. Hence bagasse can be had at a reasonbale price only from factories, situated near the collieries, *i.e.* from factories in Bihar and Orissa and Bengal.

The quantity of cane crushed by factories in Bihar and Orissa and Bengal, may be estimated at 20,00,000 tons and the dry bagasse production at about 3,00,000 tons per year. The minimum economical capacity of a fibre-board factory, is 20 to 25 tons dry bagasse per day or 7,000 to 7,500 tons per year of 300 working days. Therefore if even 50 per cent of the factories in this area, substitute only 10 per cent of their bagasse by coal, there should be scope for at least two board factories there. The fact that there are very few factories in Bengal, however, precludes the possibility of having a board factory there.

V. *Conclusion.*

From what has been stated above, it is evident that the only area where a bagasse board factory can be started is in Bihar and Orissa, in tracts where sugar factories are sufficiently near to the collieries. Apart from the cost of coal or of any other substitute, there are a number of factors which influence the cost of raw material such as baling, storage and handling of bagasse.

Over and above these, a very important item of expense, which is to be considered in connection with a concern such as this, is the big and expensive sales organisation which will be necessary in order to popularize these new products and to compete with other producers.

In view of the multiplicity of the factors to be taken into consideration before establishing a Paper and Board factory from bagasse, as explained above, it is necessary that each project should be considered on its own merits.

ENCLOSURE III.

Copy of note, dated 23rd October 1935, by Mr. M. P. Bhargava, Officer-in-Charge, Paper Pulp Section.

As pointed out in our notes submitted to the Imperial Council of Agriculture in August 1933 and in July 1935 an important factor, bearing on the utilisation of bagasse for the manufacture of boards and packing (bag) papers, is its cost *ex* the paper or the board mill. Bagasse is used as fuel in the sugar factories, and its price for board or packing paper would obviously be governed by the cost of wood fuel or coal which

may be used as substitutes for it. According to the Sugar Technologist, if wood fuel is used as a substitute, the cost of bagasse would come to Rs. 12 to Rs. 14 per ton *ex* sugar factories. To this the cost of baling, storage, handling and transport charges has to be added. As we pointed out before, at this cost (about Rs. 14 to Rs. 17 per ton) it appears to be uneconomical to use bagasse for board or packing paper manufacture. Wood, therefore, has to be ruled out of consideration. The substitution of coal is possible only in the sugar factories in Bengal and Bihar, situated near the collieries and where the cost of coal *ex*-factory may be about Rs. 6 to Rs. 7 per ton. Bagasse from such factroies is then likely to be available to a board or paper mill. in the neighbourhood, at a cost of about Rs. 8 to Rs. 9 per ton, as according to the Sugar Technologist the price of bagasse may be estimated to be equal to the value of coal at the factory, taking into consideration the expense involved in changing the bagasse burning boilers into coal burning boilers. This cost of bagasse appears to be such as the board or paper industry may bear. The sugar factories which may supply bagasse for board or paper manufacture, will, therefore, have to replace all or part of their present bagasse boilers by coal boilers.

In view of the fact that there is an adequate and permanent demand for boards and packing papers, which is likely to grow considerably in the future, there appears to be no ground for the fear that the demand for bagasse for manufacturing these products may not be a permanent one, particularly as no other raw material for the industry is likely to be obtained at a cheaper price. The sugar factories, therefore, need not hesitate on the score of demand to incur the expense necessary for effecting the change in their boiler equipments. Whether a number of factories carry out the change in only a part of their boiler equipment or a few large ones carry it out in their entire boiler equipment is a question which may be examined when any concrete project for paper or board manufacture is considered. The latter alternative, however, appears to be more feasible and economical, inasmuch as the area from which bagasse may be drawn would be narrower its supply would be more uniform and certain and charges for baling, handling, transport, etc., would be reduced to the minimum.

The markets for boards and packing papers manufactured in Bengal or Bihar will be not only in those provinces but throughout the country particularly in Bombay and Sind, the share of which in the present imports of these products is about 50 per cent. It appears, therefore, that it would be necessary to put up as large units as possible in order to attain maximum possible economies of large scale production and thus have adequate margin for payment of long distance railway freights on finished products The figures given by the Sugar Technologist show that the quantities of bagasse available in Bengal and Bihar are more than ample not only to meet the country's present total demand for boards and packing papers but also the increased demand of the near future.

The average fibre length in canes grown in Bengal and Bihar may be shorter than that in canes, now grown in Northern India. For the production of packing and bag papers an admixture of a certain percentage of bamboo fibre may be necessary. In both the Provinces bamboo is available in plenty.

As the Sugar Technologist says, an efficient Sales Organization will be necessary, as it is in the case of any new product the manufacture of which is undertaken in the country, to push the sales of the products like insulation and structural boards, etc., the demand for which is still limited and has to be created. Perhaps the Marketing Board under the Imperial Council of Agriculture may be of help in this. I entirely agree with the Sugar Technologist that, in view of the multiplicity of factors, which need to be taken into account, it is necessary to examine each project for the manufacture of boards or packing papers on its own merits. We came to the same conclusion in our note submitted to the Council in July last.

ANNEXURE II.

Extract from the proceedings of the Sugar Committee meeting held on July 8th, 1936.

Report on the utilisation of bagasse for the paper and board industry by Mr. M. P. Bhargava, officer-in-charge, Paper Pulp Setcion, Forest Research Institute, Dehra Dun.

In introducing the subject. Mr. Srivastava pointed out that the whole question of manufacturing brown paper and card board, from bagasse was one of costs. He also pointed out that the boiler plants in this country had not worked with great efficiency though conditions had recently changed. Surplus bagasse was now obtained with increased efficiency, especially in the Western districts of the United Provinces. It was therefore possible that surplus bagasse might now be available at a cheaper rate and the question of disposing of it had to be considered in good time, as otherwise we would be faced with the same difficulties as we had been experiencing in connection with the disposal of molasses. He had been in correspondence with Mr. Bhargava and if the Committee desired, the details of the scheme could be worked out. Chowdhry Mukhtar Singh said that a new cane No. 331 had a megass content of 31 per cent in the month of April which went up to 40 per cent in May especially in the Western districts of the United Provinces and that it would be possible to have surplus bagasse in large quantities. The factories in the Western United Provinces would have to face a difficult situation when and if sugar prices declined. It was therefore necessary that subsidiary aspects of the industry should be developed which would bring in some money to the factories. If surplus bagasse was available, uses for it must be found and a sum of Rs. 10,000 to Rs. 15,000 was a small sum for the purpose. He therefore agreed with Mr. Srivastava, and suggested that the question should be further investigated at the Forest Research Institute without waiting for the decision of the Committee next year ; that necessary funds should be provided to Mr. Bhargava to carry on the work as regards the production of mechanical pulp.

The Chairman thought that it would be a good way of going about the proposal if the President of the Forest Research Institute, who is a member of the Advisory Board, were asked if he could give facilities for the development of the work and be informed that the Committee recommended a sum of Rs. 10,000 to be set aside for the purpose.

Lala Shri Ram while supporting the proposal of Chowdhry Mukhtar Singh suggested that the Chairman should speak to the President of the Forest Research Institute to expedite the scheme and that a sum not exceeding Rs. 15,000 should be provided for carrying on the experiment.

Rao Bahadur Venkatraman suggested that information might be given to him by the Sugar Technologist, classifying the canes according to the outturn of short and long fibres as he may be able to develop the canes in the light of the information available. It was pointed out that canes with short fibre were useful for the production of sugar. The Committee agreed unanimously that the President of the Forest Research Institute should be asked to give facilities and that the Governing Body be asked to allot funds up to Rs. 15,000 for the purpose.

APPENDIX VI-B.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 17th July 1936, on Subject No. 8-B. (iv) :—Recommendations of the Crop Planning Conference, June 1934, regarding the extension of Sugarcane Cultivation in India.

The attached notes dated the 25th May 1936 and 29th June 1936, for the Sugar Committee (Annexures I and II), and an extract from the proceedings of the Committee (Annexure III), are circulated for consideration by the Board.

ANNEXURE I.

NOTE BY THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, DATED THE 25TH MAY 1936, ON SUBJECT NO. 18 OF THE AGENDA OF THE SUGAR COMMITTEE, JULY 1936 :—RECOMMENDATIONS OF THE CROP PLANNING CONFERENCE, JUNE 1934, REGARDING THE EXTENSION OF SUGARCANE CULTIVATION IN INDIA.

With reference to the discussions at the last meeting of the Committee on the subject (pages 13-14 of the printed proceedings), the attached correspondence (Enclosure I) with Local Governments (including Delhi), the Directors of Agriculture of Bengal and Mysore, and the interested Indian States, contains the views of these Governments on the suggestions made, namely,

(*i*) that crop-cutting experiments on sugarcane should be re-instituted.

(*ii*) that the areas under planted and ratoon canes be given separately.

(Replies from Madras, Hyderabad and Bhopal are awaited.)

It will be seen that, with the exception of Bombay, Bihar and Delhi, the Local Governments and States which have so far replied are prepared to adopt the suggestions and some have already done this.

Reference is invited to the suggestion made by the Director of Agriculture, Bengal, that the returns should be recorded in terms of cane and not *gur* as at present. This appears to be sound and is in accordance with a recommendation made by the Indian Sugar Committee (1919). It is therefore proposed that Local Governments, etc., should in future be invited to give the yield of cane in terms of the weight of cane and not *gur*, and that separate experiments should be carried out by them with a view to find out the exact conversion figures regarding *gur* and cane wherever this is not already being done.

ANNEXURE II.

SUPPLEMENTARY NOTE BY THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, DATED THE 29TH JUNE 1936, ON SUBJECT NO. 18 OF THE AGENDA OF THE SUGAR COMMITTEE, JULY 1936 :—RECOMMENDATIONS OF THE CROP PLANNING CONFERENCE, JUNE 1934, REGARDING THE EXTENSION OF SUGARCANE CULTIVATION IN INDIA.

In continuation of the note, dated the 25th May 1936 (Annexure I), the undermentioned letters are circulated :—

(*i*) Letter No. F.102-I/35-A., dated the 28th May 1936, to the Director of Agriculture, Madras. (Enclosure I.)

(*ii*) Letter No. Roc. 1936. Hc.547/35-36, dated the 15th June 1936, from the Director of Agriculture, Mysore. (Enclosure II.)

(*iii*) Letter No. 4371-P./F.356-1936, dated the 13th June 1936, from the Hon'ble the Resident at Hyderabad. (Enclosure III.)

ANNEXURE III.

EXTRACT FROM THE SUGAR COMMITTEE PROCEEDINGS.

(Subject No. 13) Recommendations of the Crop Planning Conference regarding extension of sugarcane cultivation.

In introducing the subject the Chairman quoted figures showing the rate at which the acreage under sugarcane had increased in India during recent years and pointed out that for the first time during 1935-36 this had exceeded 4 million acres. The increase in the quantity of cane produced was very much greater than the additional quantity of cane crushed in modern factories. As a result, the calculated quantity of cane left to be converted into *gur* shows considerable increase. As the cultivation of cane involves a good deal of labour and as sugarcane is a perishable commodity, this question was of great importance. In order to ascertain the exact position the local Governments and the interested Indian States were requested to arrange for the re-institution of crop-cutting experiments on sugarcane and the recording of figures separately for the areas under plant and ratoon canes. Excepting Bihar local Governments had agreed to the proposal.

Mr. Sethi explaining the difficulty in regard to Bihar stated that owing to lack of necessary staff it was not possible for his province to supply the required information. If this Committee made a recommendation to that effect, he would approach his local Government for the necessary funds for engaging the staff.

The Chairman said that he had a discussion on this subject with the Senior Member, Board of Revenue, United Provinces, who suggested two methods of collecting the statistics, namely, by means of a random survey and by an annual check of 10 per cent of the cropped area. For the latter method it was suggested that a small permanent staff might be maintained which would collect the statistics for 10 per cent of the area each year, thus completing the entire area in 10 years. It was felt, however, that for statistical purposes this system would not be as accurate as that of randomised samples, although it had the advantage of being cheaper.

Mr. Herford stated that some mills in Bihar (such as those controlled by Messrs. Begg Sutherland and Company, Limited), kept regular record of the quantity of cane supplied to the mills by growers having fields of known areas, as well as figures for areas under plant and ratoon canes. He suggested that such figures may be obtained from the mills and used for statistical purposes. The Chairman approved of the suggestion.

Lala Shri Ram agreed with Mr. Sethi's suggestion for addressing the Bihar Government and also proposed that the Government of India might deduct a suitable sum of money from the share of Bihar in the Sugar Excise fund and the amount thus deducted should be utilized for engaging the staff required by Mr. Sethi. The Chairman said that this might be possible, especially as the amount allotted to the provinces next year would probably be larger.

Mr. Srivastava pointed out that the information regarding crop cutting experiments and areas under plant and ratoon canes which has been called for from local Governments would take at least 2 or 3 years to collect. The production of sugar and cultivation of cane were, however, increasing at such a rapid rate that it may be unsafe to wait for such a long period before coming to a decision regarding the desirability of further extension of sugarcane cultivation in India. He therefore suggested that the present position in this connection may be explained to the Government of India and the local Governments and a recommendation may be made to them not to actively assist in further increasing the area under sugarcane except in localities adjoining existing sugar factories. There was particular danger of this happening in connection with the extension of irrigation schemes. The second point to which he drew attention was that it was necessary not only to know the cost of production of sugarcane (for which an enquiry financed by the Research Council was already being conducted) but also to know the point at which it would become unprofitable for the cultivator to grow cane and when he would take up other alternative crops. He stated that with a larger production of sugar the price of sugar would continue to go down and the price of cane would follow suit and it was therefore necessary to have the information referred to by him.

Concluding, Mr Srivastava emphesized that the future activities of the local Governments in connection with the cane crop should be concentrated on the improvement of the quality of cane and the lowering of its cost of cultivation and not to an extension of the area under cane.

Sir William Stampe referring to Mr. Srivastava's remarks in connection with the extension of cane acreage under irrigation schemes stated that as the major portion of cane was utilized for *gur* making, there should be no danger if the per capita consumption of *gur* increased. He emphasized that the rural population as a whole was underfed and a larger consumption of *gur* would therefore be desirable. Mr. Sherwani pointed out that the price of *gur* had already gone down this year to Rs 1-8-0 per maund in certain parts of the United Provinces and that restriction was necessary at once. The Chairman said that this may be due to local over-production. He felt that it would be unwise for this Committee to recommend restrictions at this stage until the information called for from the local Governments was available.

Chowdhry Mukhtar Singh, however, favoured a decision in regard to the question of restriction of cane cultivation now, otherwise the crop may be faced with difficulties similar to those experienced by jute. The Chairman, however, drew attention to the total absence of statistics *relating to consumption* as a result of which it was impossible to state if the stage of over-production had been reached.

Lala Shri Ram suggested that the attention of local Governments may be drawn to the dangers connected with increasing production and that they may be requested to give more attention to improving the quality of cane and reducing its cost of cultivation rather than to increasing the acreage.

Mr. Sethi pointed out that there was still insufficient cane in Bihar to meet the requirements of the factories for the full season. Mr. Carbery stated that there was still a shortage of cane in Bengal, while Khan Bahadur Maulvi Fateh-ud-Din pointed out that Punjab had to import *gur*.

Summing up the discussion, the Chairman proposed that the local Governments should be asked to consider whether it is wise actively to encourage further increases in the sugarcane area and whether they should not concentrate on the improving of sugarcane quality.

This was agreed to unanimously.

ENCLOSURE I.

LETTER FROM THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, TO ALL LOCAL GOVERNMENTS AND THE CHIEF COMMISSIONER, DELHI, NO. F. 102-I|35|A., DATED THE 21ST NOVEMBER 1935.

I am directed to say that one of the conclusions arrived at by the Crop Planning Conference convened by the Government of India in June 1934 was to the effect that the area under sugarcane in this country was not of a magnitude to affect the general question of crop-planning. It was further decided to refer the question whether it was advisable to have larger areas under sugarcane cultivation, to the Sugar Committee of the Imperial Council of Agricultural Research.

2. The subject was accordingly considered at the last meeting of the Sugar Committee in July 1935 and it was decided that in the absence of reliable data regarding the yield of cane per acre it was not possible to lay down any general directions regarding the optimum area under cane cultivation in this country. The Committee in the circumstances recommended that Local Governments should be requested again to undertake *crop-cutting experiments regarding the yield of cane* and have the areas under planted and under ratoon canes separately reported. This recommendation was accepted by the Adivsory Board of the Council in July last.

3. It is hoped that the Local Government will find it possible to take action as suggested by the Advisory Board *(and also arrange, if possible, to communicate the contents of this communication to the Rampur Durbar for necessary action). I am to request therefore that the decision of the *Local Government* in the matter may be communicated to the Council at an early date.

*( ) to U. P. only.

Endorsed to the F. and P. Department for communication to the following Indian States ;—

Hyderabad,

Mysore,

Baroda,

Bhopal,

Kolhapur.

ENCLOSURE II.

LETTER FROM THE SECRETARY TO THE GOVERNMENT OF BOMBAY, REVENUE DEPARTMENT, No. 2338-A.|33, DATED THE 25TH MARCH 1936.

With reference to your letter, No. F. 102-I|35|A., dated 21st November 1935, I am directed by the Government of Bombay (Transferred Departments) to forward for your information copies of the correspondence specified below and to state that, in the circumstances stated therein, they do not consider it necessary to undertake crop cutting experiments regarding the yield of cane :—

Memorandum from the Chief Agricultural Officer in Sind, No. 362, dated 9th December 1935.

Letter from the Director of Agriculture, No. 493, dated 18th March 1936.

I

COPY OF MEMORANDUM FROM THE CHIEF AGRICULTURAL OFFICER IN SIND, No. 362, DATED THE 9TH DECEMBER 1935.

The Chief Agricultural Officer in Sind presents compliments to the Under Secretary to the Government of Bombay, Revenue Department, and, with reference to his endorsement No. 2338-A.|33, dated 29th November 1935, forwarding a copy of letter, No. F. 102-I|35|A., dated 21st November 1935, from the Secretary, Imperial Council of Agricultural Research, has the honour to state that the sugarcane crop in Sind is, at present, of very minor importance, the area in 1935 being only 3,000 acres. It is unlikely that any considerable increase in this area need be expected in the near future owing to the insufficiency of water from the Barrage Canals for cane cultivation except under exceptional conditions, *e.g.*, at the tail of canals or large minors. Accordingly, the Chief Agricultural Officer in Sind does not consider that any useful purpose would be served at present by the commencement of crop-cutting experiments on the cane crop in the Barrage areas. With the exception of the Pioneer Sugarcane Company's estates in Nawabshah District, practically all cane produced in Sind is cut and sold locally for chewing.

II

COPY OF LETTER FROM THE DIRECTOR OF AGRICULTURE, NO. 493, DATED THE 18TH MARCH 1936.

SUBJECT :—*Crop Planning Conference. Proceedings of——. Action taken on recommendation of——.*

With reference to Government endorsement, No. 2338-A.|33, Revenue Department, of 29th November 1935, forwarding copy of letter, No. F. 102-I|35|A., of 21st November 1935, from the Secretary, Imperial Council of Agricultural Research, New Delhi, I have the honour to remark as follows :—

The Secretary of the Imperial Council of Agricultural Research has apparently forgotten that the Imperial Council and the Indian Central Cotton Committee are jointly financing the enquiry into the cost of production of sugarcane and cotton and the rotational crops which will be completed shortly. In the case of this enquiry which is being done in a most minute manner, it ought to be possible to get figures of yield of sugarcane per acre from the cane producing districts of India. The part of the enquiry which is being conducted in the Bombay Presidency is being done on 47 plots of different acreage spread over six villages on the Nira Left Bank Canal. The yield per acre is being recorded in *gul* ; but since we know the ratio of *gul* to cane, the cane weight per acre is easily calculated. Similar data must be obtainable from the same enquiry in other parts of India.

Again I have no doubt that all the sugar factories would be willing to give the yield per acre which they get.

ENCLOSURE III.

LETTER FROM THE DIRECTOR OF AGRICULTURE, BENGAL, NO. 21295, DATED THE 23RD DECEMBER 1935.

With reference to your letter No. F. 102-I|35|A., dated 21st November, 1935, addressed to the Secretary to the Government of Bengal, Department of Agriculture and Industries, I have the honour to say that under present rules the weight of *gur* has to be recorded in connection with the crop-cutting experiments on sugarcane for submission to the Director-General of Commercial Intelligence. If the weight of cane only is recorded it will be possible to undertake a very much larger number of experiments and the results will be much more reliable. The control of experiments where *gur* is recorded is difficult and in some cases the weights recorded have been found to be far from correct. I therefore suggest that for the purposes of crop forecasts the Imperial Council of Agricultural Research Department should press for returns being recorded in terms of cane and not *gur* as at present.

ENCLOSURE IV.

LETTER FROM THE SECRETARY TO GOVERNMENT, UNITED PROVINCES. No. 169-A.|XIIA.-546, DATED THE 26TH FEBRUARY 1936.

With reference to your letter No. F. 102-I|35|A., dated November 21, 1935, I am directed to say that crop cutting experiments, regarding the approximate yield of " sugarcane manufactured (*gur*) " per acre cropped, are already in progress in some selected districts in this province, and the quinquennial figures are reported to the Director-General of Commercial Intelligence and Statistics, Calcutta.

2. The Governor, acting with his Ministers, considers that, according to the suggestion of the Advisory Board of the Imperial Council of Agricultural Research, it will be possible to carry out crop cutting experiments on sugarcane in all the districts where this crop is important, the areas under planted cane and ratoon cane being reported, and the figures shown in the returns separately, for each district. It is proposed that the experiments will give the weight of sugarcane, and not of *gur*, as at present. I am to say that steps are being taken to give effect to the proposal.

3. The contents of your letter have been communicated to the Rampur Durbar, as desired.

ENCLOSURE V.

LETTER FROM THE SECRETARY TO GOVERNMENT, UNITED PROVINCES, No. 985-A., DATED THE 13TH APRIL 1936.

With reference to paragraph 3 of this Government's letter No. 169-A.| XIIA.-546, dated February 26, 1936, I am directed to say that the Rampur Durbar report that sugarcane crop cutting experiments were carried out in all the *tahsils* of the State and that the average outturn per acre worked out at about 350 maunds for planted sugarcane and 200 maunds for cane under ratoon. An inquiry is being made whether the cane referred to was of the Coimbatore variety or *desi*. (Since heard that it is of Coimbatore variety.)

ENCLOSURE VI.

LETTER FROM THE SECRETARY TO GOVERNMENT, PUNJAB, No. 862-D., DATED THE 16TH MARCH 1936.

In reply to your letter No. F. 102-I|35|A., dated the 21st November 1935, I am directed to say that the Punjab Government have decided to accept the recommendation of the Advisory Board of the Imperial Council of Agricultural Research that the Local Government should undertake crop-cutting experiments regarding the yield of cane and have the areas under planted and under ratoon canes separately reported.

2. I am to add that with this end in view, standing instructions are being issued to the Provincial Revenue and Agricultural Departments who conduct and report the results of such experiments.

ENCLOSURE VII.

LETTER FROM THE SECRETARY TO GOVERNMENT, EDUCATION AND DEVELOPMENT DEPARTMENT, BIHAR AND ORISSA, No. 193-D., DATED THE 7TH JANUARY 1936.

In reply to your letter No. F. 102-I|35|A., dated the 21st November 1935. I am directed by the Government of Bihar and Orissa (Ministry of Education) to say that crop cutting experiments on sugarcane would not be of any value and might be positively misleading unless they are carried out by a specially trained staff. As the Local Government have no such staff at present, they regret that it would not be possible to undertake this work.

2. As regards the recording of the areas under planted and under ratoon canes separately, I am to say that in the absence of any village revenue agency in the province, the crop forecast figures are collected by the district officers through the village *chowkidars* and *dafadars*. The figures of acreage of sugarcane at present collected do not differentiate between planted and ratoon canes. It would not be practicable to obtain separate figures through the existing agency.

ENCLOSURE VIII.

LETTER FROM THE REVENUE SECRETARY TO GOVERNMENT, CENTRAL PROVINCES, No. F. 446|1260|XII, DATED THE 30TH MARCH 1936.

With reference to your letter No. F. 102-I|35|A., dated the 21st November, 1935, I am directed by the Government of the Central Provinces (Ministry of Agriculture) to say that this Government has been making crop-cutting experiments regarding the yield of sugarcane ever since 1923 and has decided to continue these.

2. Action is also being taken to have the areas under planted and ratoon canes reported separately.

ENCLOSURE IX.

LETTER FROM THE SECRETARY TO THE GOVERNMENT OF ASSAM, IN THE TRANSFERRED DEPARTMENTS, No. 4671-E., DATED THE 12TH DECEMBER 1935.

I am directed to refer to your letter No. F. 102-I|35|A., dated the 21st November 1935, and to say that the Government of Assam agree to undertake crop-cutting experiments on sugarcane, as suggested, the out-turn of cane only and not of *gur* being recorded.

ENCLOSURE X.

LETTER FROM THE SECRETARY TO GOVERNMENT, N. W. F. P., TRANSFERRED DEPARTMENTS, No. 953-T.D.N.|32|34, DATED THE 25TH MAY 1936.

I am directed by the Government of the North-West Frontier Province (Ministry of Transferred Departments) to refer to your letter No. F. 102-I|35|A., dated the 21st November 1935, and to state that the Local Government are of the opinion that provision of statistics regarding planted and ratooned canes, would involve too much work for the Revenue staff. They have, however, issued instructions to the Agricultural Department to obtain a rough estimate by the method of sampling.

As regards figures for improved varieties, the Local Government have directed the Revenue Staff to obtain these from the next Kharif Girdawaris.

ENCLOSURE XI.

LETTER FROM THE CHIEF COMMISSIONER, DELHI, No. B. 72|36-R. & A., DATED THE 14TH MARCH 1936.

In reply to your letter No. F. 102-I|35|A., dated the 21st November 1935, I have the honour to say that the practice of crop experiments in the Delhi Province has been discontinued since 1914. The Deputy Commissioner, Delhi, is of opinion that in the small rural area of Delhi Province such sugarcane experiments as he understands to be proposed would scarcely be worth while.

2. If however the Imperial Council of Agricultural Research desires to press the matter as regards Delhi, then some particulars as to methods and as to what exactly is desired (I have only a very small staff under one Agricultural Assistant) may kindly be furnished for the information and guidance of the Deputy Commissioner.

ENCLOSURE XII.

LETTER FROM THE DIRECTOR OF AGRICULTURE IN MYSORE, No. ROC. 1936|HC. 547 OF 1935-36, DATED THE 28TH FEBRUARY 1936.

With reference to your Circular letter No. F. 102-I|35|A., dated 21st November 1935 to Local Governments &c., I have the honour to request you to be so good as to inform this office, if it will do if we were to furnish you with figures from the Irwin Canal Farm, Mandya, and also from ryots' lands in that area in which every holding and its extent with the crop grown on it is registered by the Sugar Company every year in their books. Such figures are available to H. M. 320 cane for 3,000 acres in 1933-34 ; for 9,000 acres in 1934-35 and during 1935-36 figures will be collected for nearly 12,000 acres.

ENCLOSURE XIII.

COPY OF A LETTER FROM THE AGENT TO THE GOVERNOR-GENERAL FOR THE GUJARAT STATES AND RESIDENT AT BARODA, TO THE POLITICAL SECRETARY TO THE GOVERNMENT OF INDIA IN THE FOREIGN AND POLITICAL DEPARTMENT, NEW DELHI, No. 4778 OF 1936, DATED THE 19TH FEBRUARY 1936.

SUBJECT :—*Crop planning—Sugar-cane cultivation.*

I have the honour to refer to Government of India Foreign and Political Department endorsement No. D.-2680-I.A.|35, dated the 4th December 1935, on the above subject, and to state that the Baroda Government have instructed their Agricultural Department to undertake a sufficient number of small area cuttings to ascertain the yield of cane per acre. The result will be communicated to the Government of India when known.

ENCLOSURE XIV.

COPY OF A LETTER FROM THE AGENT TO THE GOVERNOR-GENERAL FOR THE DECCAN STATES AND RESIDENT AT KOLHAPUR, TO THE POLITICAL SECRETARY TO THE GOVERNMENT OF INDIA IN THE FOREIGN AND POLITICAL DEPARTMENT, SIMLA, NO. P. 845|35, DATED THE 6TH MAY 1936.

Optimum area under cane cultivation.

I have the honour to refer to Memorandum No. D. 2680-I.A.|35, dated the 4th December 1935, from the Government of India in the Foreign and Political Department, on the above subject, and to state that the Prime Minister of Kolhapur reports that the crop cutting experiments regarding the yield of cane and the areas under the planted and ratoon canes cannot be carried out this year as the season of the cane crops is practically over. The Durbar intimate that the crop cutting experiments will be carried out next season. I would request that the Secretary, Imperial Council of Agricultural Research, may kindly be informed accordingly, if there is no objection.

ENCLOSURE I.

COPY OF A LETTER NO. F.102-I/35/A., DATED THE 28TH MAY 1936, FROM THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, TO THE DIRECTOR OF AGRICULTURE, MYSORE, BANGALORE.

SUBJECT :—*Crop-cutting experiments on sugarcane.*

With reference to your letter No. Roc. 1936.Hc.-547, dated the 28th February 1936, I am directed to say that, as the area referred to in the latter is too small, it is suggested that crop-cutting experiments should also be carried out outside the area mentioned by you, if possible.

ENCLOSURE II.

LETTER FROM THE DIRECTOR OF AGRICULTURE IN MYSORE, NO. ROC. 1936. HC.547/35-36, DATED THE 15TH JUNE 1936.

With reference to your No. Roc. 1936. Hc.547 of 35-36 regarding crop cutting Experiments on Sugarcane, I have the honour to state, that the experiments mentioned in your letter quoted above will be carried out during harvest season of 1936-37 in areas other than the Irwin Canal Area.

ENCLOSURE III.

COPY OF A LETTER NO. 4371-P./F.-356-1936, DATED HYDERABAD RESIDENCY, THE 13TH JUNE 1936, FROM THE HON'BLE THE RESIDENT AT HYDERABAD, TO THE POLITICAL SECRETARY TO THE GOVERNMENT OF INDIA IN THE FOREIGN AND POLITICAL DEPARTMENT, SIMLA.

SUBJECT :—*Cultivation of sugarcane.*

With reference to Foreign and Political Department endorsement No. D. 2680-I.A./35, dated the 4th December 1935, on the above subject, I have the

honour to forward herewith a statement showing the yield of sugarcane in the Hyderabad State, received from H. E. H. the Nizam's Government.

2. His Exalted Highness' Government report that crop cutting experiments are carried out by their Revenue Department and that the approximate yield of indigenous sugarcane is 6,000 pounds per acre and that of Coimbatore sugarcane is 6,500 pounds per acre.

TRANSLATION.

Statement showing the yield of sugarcane.

Serial No.	District.	1345 Fasli (1935-36).			Remarks.
		Indigenous sugarcane.	Coimbatore sugarcane.	Total area.	
1	2	3	4	5	6
1	Atraf-i-Balda	198	30	228	
2	Warangal	96	325	421	
3	Karimnagar	4	..	4	
4	Adilabad	96	100	196	
5	Medak	200	2,500	2,700	
6	Nizamabad	500	10,000	10,500	
7	Mahbubnagar..	38	100	138	
8	Nalgonda	71	250	321	
9	Aurangabad	2,794	4	2,798	
10	Bir	4,728	1	4,729	
11	Nanded	686	2	688	
12	Parbhani	1,124	5	1,129	
13	Gulbarga	1,604	3	1,607	
14	Usmanabad	7,050	0	7,050	
15	Raichur	2,449	25	2,474	
16	Bidar	21,709	400	22,109	
	Total ..	43,347	13,745	57,092	

APPENDIX VII.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 5th June 1936, on Subject No. 8-C (i) :—Application from the Director, Imperial Institute of Agricultural Research, for a grant of Rs. 1,11,000 spread over five years for the continuation of research *on mosaic and other diseases of sugarcane.*

Attention is invited to the attached copy of notes, dated the 9th March 1936, and 5th June 1936, circulated to the Sugar Committee (Annexures I and III). The recommendations of the Committee will be submitted to the Board in due course for consideration.

ANNEXURE I.

NOTE BY THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, DATED THE 9TH MARCH 1936, ON SUBJECT NO. 12 OF THE AGENDA OF THE SUGAR COMMITTEE, JULY 1936 :—APPLICATION FROM THE DIRECTOR, IMPERIAL INSTITUTE OF AGRICULTURAL RESEARCH, FOR RS. 1,11,000 *SPREAD OVER FIVE YEARS FOR THE CONTINUATION FOR RESEARCH ON MOSAIC AND OTHER DISEASES OF SUGARCANE.*

At its meeting held in January 1930, the Sugar Committee considered a scheme submitted by the Imperial Mycologist for providing a separate mycological staff to deal with work on sugarcane diseases and recommended it after considerable revision of the cost involved (*vide* pages 12—14 and 16-17 of the printed proceedings of the Committee). The Governing Body sanctioned the scheme at its meeting held in July 1930 at a cost of Rs. 1,46,890 spread over five years inclusive of a non-recurring grant of Rs. 24,790. Financial stringency, however, necessitated curtailment of the cost of approved schemes and this scheme was in the first instance sanctioned at a cost of Rs. 12,000 non-recurring and Rs. 53,000 recurring for a period of 3 years and started with effect from the 1st June 1932. On the expiry of that period it was extended for the remaining two years of the original sanction at a cost of Rs. 39,980. The total cost of this scheme for five years, on the reduced scale adopted by the Council is not likely to exceed Rs. 91,800 as against Rs. 1,46,890 already sanctioned by the Governing Body. The progress reports of the scheme for 1932-33 and 1933-34 were considered and adopted by the Sugar Committee at its sixth and seventh meetings held in November 1933 and July 1935 respectively.

2. The scheme is due to expire on the 31st May 1937, and the Director, Imperial Institute of Agricultural Research, has submitted proposals (Enclosure) for its extension for a period of five years with effect from the 1st June 1937, at a cost of Rs. 1,11,000, on the same scale of expenditure as at present. The proposal has been approved by the Department of Education, Health and Lands, and is now submitted for consideration of the Sugar Committee.

ENCLOSURE.

COPY OF A LETTER No. 1075-D., DATED THE 22ND FEBRUARY 1936, FROM THE DIRECTOR, IMPERIAL INSTITUTE OF AGRICULTURAL RESEARCH.

I have the honour to * * * * * * * * submit proposals for extension of the scheme for research on mosaic and

other diseases of sugarcane for a further period of five years from 1st June 1937, the date on which the present sanction will expire.

The enclosed note by the Imperial Mycologist gives a brief account of the work done so far as well as the lines to be pursued during the period of the proposed extension. In view of the importance of the work to the sugarcane industry, I consider it desirable that the scheme should be continued for a further period of five years. The Government of India in the Education, Health and Lands Department are agreeable to the proposal, *vide* the enclosed copy of their letter (Enclosure IV) No. F.-35-2|36-A, dated the 14th February 1936.

The expenditure involved during the period of extension is estimated at Rs. 1,11,000, which, together with the estimated expenditure for the sanctioned period of five years, will bring the total cost of the scheme to about Rs. 2,02,800.

Extension of Scheme for Research on Mosaic and other diseases of sugarcane for a second period of five years.

In June 1937, the five-year scheme for research on mosaic and other diseases of sugarcane will come to an end. This scheme sanctioned the appointment of one Class I Officer, one Class II officer, and one Research Assistant, together with Clerk, Fieldman, etc.

Owing to financial stringency the original five-year scheme was first sanctioned for 3 years, with a non-recurring grant of Rs. 12,000, and a recurring grant of Rs. 53,000. For these three years the actual expenditure was considerably less than the Rs. 65,000 anticipated (Enclosure I), the saving being mainly due to (1) delay in appointment of initial staff, and (2) the departure of the Sugarcane Mycologist early in 1935 to take up another post.

In May 1935, the scheme was extended for the further 2 years at a cost not to exceed Rs. 39,980 as shown in Enclosure II.

In November 1935, Dr. B. L. Chona was offered the post of Sugarcane Mycologist and the staff will thus again reach full strength. Much work remains to be done, and an extension of the scheme for a further five years' period is very desirable in the interests of sugarcane growing in India. It is therefore proposed that the Imperial Council of Agricultural Research be asked to extend the scheme from June 1937 to May 1942 at an expenditure indicated in Enclosure III. Laboratory accommodation, land, and other facilities will still be provided by the Imperial Institute of Agricultural Research at Delhi.

A summary of past and future work is given below :—

Work has been delayed not only by shortage of staff as mentioned above, but also by the interruptions and difficulties arising from the Bihar earthquake. Since that time, improvised laboratory accommodation, without gas or water supply, has been provided.

Nevertheless a large amount of useful work has been accomplished. As regards mosaic, it has been shown that under the conditions of Northern India natural spread is extremely slight, and mosaic can be effectively controlled by selection of setts. Moreover, careful experiments repeated

over a number of years with Co. 213 have conclusively shown that this widely grown cane, though susceptible to mosaic, is very tolerant, *i.e.*, the loss in yields is comparatively slight under ordinary conditions.

Surveys have been carried out in various districts, and much information has been accumulated as to the susceptibility or resistance of different varieties of cane, both to mosaic, and to a lesser extent to fungal bacterial diseases.

From the more fundamental aspect, the study of mosaic virus has been pursued in various directions. The conditions for successful artificial inoculation have been worked out, also the effect of inoculating juice from affected cane into other varieties and into other genera of plants. The effect of climatic conditions on mosaic, and of mosaic on chlorophyll content, have been studied.

Physical and chemical factors—heat, cold, filtration, chemical substances, *p*H, etc.—have been tested as to their affect on the activity and viability of mosaic juice. Indications have been found confirming the existence of several kinds of sugarcane mosaic virus. Serum work is still in progress, using rabbits as test animals, to check the specificity of virus from different sources.

A tentative theory of the association of a bacterial cyclostage with mosaic infection has been put forward. Much further evidence is required, however, before this somewhat revolutionary theory can be regarded as established and it is hoped that this work will be continued by the late Sugarcane Mycologist in his new post.

As regards fungal and bacterial diseases, much fresh information has been gathered regarding the known diseases or red rot, smut, top rot, etc. Pineapple disease and red stripe have been found to occur in India, and several new seedling diseases and the bacterial " Stinking rot " have been described for the first time. Red rot can be adequately controlled by examination of setts before planting. Statements made in 1934-35 as to the prevalence of red rot in Bihar have been shown to be unfounded, the internal reddening of the cane being attributable to borer attack. The low sugar content of such cane was shown to be due not to destruction of sugar by micro-organisms but to other causes presenting normal sugar production.

Future Programme from December 1935.

The principal claim of the scheme to extension is that it is really a form of insurance. Considerable expansion is taking place in sugarcane growing in India, and new varieties are still being introduced. Under these conditions several fresh diseases have already been observed, *e.g.*, streak, pineapple disease, etc., and it is essential that expert assistance should at once be available to diagnose and advise regarding any outbreak that occurs. In this connection the Handbook of Sugarcane Diseases recently prepared should prove valuable.

The Officers of the Scheme have also been available for general routine advice on the prevention of disease, and it is hoped to extend this side of the work.

Mosaic has already been thoroughly studied as regards Co. canes under Bihar conditions. The move of the Imperial Institute of Agricultural Research to Delhi gives an opportunity of studying these and other canes

under different soils and climatic conditions, where spread of the disease—possibly by an insect vector—is said to be appreciable. Tonnage experiments on thick canes are desirable, since the evidence of other countries is that mosaic causes considerable loss of yield in such cases.

A great deal of work remains to be done on the purifications, transmission, and physical properties of mosaic viruses, and it is possible that fresh information on these points may prove to have unexpected practical applications.

As regards fungal and bacterial diseases, in addition to the survey and advisory work already mentioned, there is scope for further research on the more important organisms as regards their morphology and life-histories. The question of physiological races requires investigation ; for example strains of the red rot fungus from thick canes have proved more virulent than those isolated from thin canes. The rapid testing of new and existing varieties for resistance to disease can only be carried out by inoculation experiments under controlled conditions ; similarly with the effects of humidity, temperature, soil, etc., on the virulence of the disease. Finally, the inter-relationships, between different diseases occurring in succession would probably repay study.

The above account is sufficient to indicate that an ample programme exists to justify a further five years' work.

L. D. GALLOWAY,
Imperial Mycologist.

The 21st November 1935.

ENCLOSURE I.

Actual expenditure incurred during the first three years of the scheme for research on mosaic and other diseases of sugarcane.

Heads.	1st June 1932 to 31st Mar. 1933.	1st April 1933 to 31st Mar. 1934.	1st April 1934 to 31st Mar. 1935.	1st April 1935 to 31st May 1935.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Non-recurring	5,800 0 0	5,575 5 0	..	..
Pay of officers	2,562 0 0	6,714 14 0	8,043 13 0	624 0 0
Pay of establishment ..	2,280 0 0	4,383 15 0	4,624 0 0	808 2 0
Provident Fund contribution	56 0 0	154 3 0	177 0 0	28 12 0
Travelling allowance ..	277 15 0	1,721 1 0	1,799 11 0	..
Miscellaneous contingencies	1,838 10 0	1,800 7 0	2,497 8 3	18 13 0
Totals ..	12,814 9 6	20,349 13 0	17,142 0 3	1,479 11 0

Grand Total Rs. 51,786 1 9

Enclosure II.

Grant for continuance of Scheme for research on mosaic and other diseases of sugar-cane from 1st June 1935 to 31st May 1937.

Heads.	1st June 1935 to 31st Mar. 1936.	1st April 1936 to 31st Mar. 1937.	1st April 1937 to 31st May 1937.
	Rs.	Rs.	Rs.
Pay of officers	7,545	10,245	2,580
Pay of establishment	3,849	5,364	1,377
Provident Fund contribution	160	202	58
Travelling allowance	1,350	1,800	450
Miscellaneous contingencies	1,875	2,500	625
Totals ..	14,779	20,111	5,090

Grand Total Rs. 39,980

Enclosure III.

Probable expenditure for the extension proposed from 1st June 1937 to 31st May 1942.

Heads.	*1st year.* 1st June 1937 to 31st May 1938.	*2nd Year.* 1st June 1938 to 31st May 1939.	*3rd Year.* 1st June 1939 to 31st May 1940.	*4th Year.* 1st June 1940 to 31st May 1941.	*5th Year.* 1st June 1941 to 31st May 1942.
	Rs.	Rs.	Rs.	Rs.	Rs.
Pay of officers	9,380	10,040	10,700	11,360	12,020
Leave salary of officers ..	200	200	200	200	200
Pay of establishment	5,690	5,970	6,240	6,520	6,800
Leave salary of establishment ..	100	100	100	100	100
Provident Fund contribution ..	600	600	650	700	750
Travelling allowance	1,800	1,800	1,800	1,800	1,800
Miscellaneous contingencies ..	2,500	2,500	2,500	2,500	2,500
Totals ..	20,270	21,210	22,190	23,180	24,170

Grand Total Rs. 1,11,020.

ENCLOSURE IV.

COPY OF A LETTER No. F. 35-2|36, DATED THE 14TH FEBRUARY 1936, FROM THE GOVERNMENT OF INDIA, DEPARTMENT OF EDUCATION, HEALTH AND LANDS, NEW DELHI, TO THE DIRECTOR, IMPERIAL INSTITUTE OF AGRICULTURAL RESEARCH.

I am directed to say that the Government of India approve the extension of the scheme mentioned above for a further period of 5 years from 1st June 1937, and I am to request that it may be submitted direct to the Imperial Council of Agricultural Research, in accordance with the usual procedure, for an allotment of funds.

ANNEXURE II.

SUPPLEMENTARY NOTE BY THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, DATED THE 5TH JUNE 1936, ON SUBJECT No. 12 OF THE AGENDA OF THE SUGAR COMMITTEE, JULY 1936 :—APPLICATION FROM THE DIRECTOR, IMPERIAL INSTITUTE OF AGRICULTURAL RESEARCH, FOR A GRANT OF Rs. 1,11,000 SPREAD OVER FIVE YEARS FOR THE CONTINUATION OF RESEARCH ON MOSAIC AND OTHER DISEASES OF SUGARCANE.

In continuation of the note, dated the 9th March 1936 (Annexure I), the attached letter (Enclosure) from the Director, Imperial Institute of Agricultural Research, is circulated.

ENCLOSURE.

LETTER FROM THE DIRECTOR, IMPERIAL INSTITUTE OF AGRICULTURAL RESEARCH, No. 1757-D., DATED THE 24TH MARCH 1936.

SUBJECT :—*Proposals for an extension of the scheme for research on Mosaic and other diseases of sugarcane.*

I have the honour to enclose herewith a statement showing details of pay of officers and establishment for whom provision has been made in the estimate which accompanied the proposal for extension of the above mentioned scheme.

2. In the original scheme sanctioned in 1930, the scale of pay of the post of Research Assistant was fixed at Rs. 200—15—260 per mensem. As the incumbent of the post will reach the maximum of the scale in October 1936, provision has been made in the estimate for increments at the same rate during the extension period also.

3. When the Mosaic Section is transferred from Pusa to Delhi, the rates of pay of Laboratory-keeper, peons, chowkidar, Mali and coolies will have to be revised according to the rates prevailing in Delhi. The provision made on account of these posts will probably therefore have to be exceeded by 25 to 50 per cent.

Details of pay of officers and establishment for the extension period of the Mosaic Scheme.

Post.	*1st year.* 1-6-37 to 31-5-38.	*2nd year.* 1-6-38 to 31-5-39.	*3rd year.* 1-6-39 to 31-5-40.	*4th year.* 1-6-40 to 31-5-41.	*5th year.* 1-6-41 to 31-5-42.
	Rs.	Rs.	Rs.	Rs.	Rs.
1. Plant Pathologist (350—35—700)	4,830	5,250	5,670	6,090	6,510
2. Assistant Plant Pathologist (300—20—520). Pay at Rs. 380 from 23-6-37.	4,550	4,790	5,030	5,270	5,510
Total pay of Officers ..	9,380	10,040	10,700	11,360	12,020
1. Research Assistant (200—15—335). Pay at Rs. 275 from 17-10-37.	3,230	3,410	3,580	3,760	3,940
2. Fieldman (40—4—120). Pay at Rs. 80 from 1-6-37.	960	1,010	1,060	1,110	1,160
3. Clerk (40—3—100). Pay at Rs. 52 from 1-6-37.	620	660	700	740	780
4. Laboratory-keeper (12—1—25) Pay at Rs. 16 from 6-2-38.	180	190	200	210	220
5. Peons (2) at Rs. 12 each ..	280	280	280	280	280
6. Chowkidar at Rs. 10	120	120	120	120	120
7. Mali at Rs. 9	110	110	110	110	110
8. Coolies (2) at Rs. 8 each ..	190	190	190	190	190
Total Establishment ..	5,690	5,970	6,240	6,520	6,800

APPENDIX VII-A.

Supplementary note by the Secretary, Imperial Council of Agricultural Research, dated the 10th July 1936, on Subject No. 8-C (i).

In continuation of the note, dated the 5th June 1936 (Appendix VII), the attached extract from the proceedings of the Sugar Committee Meeting held on July 8th, 1936, is circulated (Annexure).

2. The extension of the scheme has been recommended for a period of two years and this involves a grant of Rs. 41,480 from the Council.

ANNEXURE.

Extract from the proceedings of the Sugar Committee meeting held on July 8th, 1936.

Application from the Director, Imperial Institute of Agricultural Research, for Rs. 1,11,000 spread over five years for the continuation of research on mosaic and other diseases of sugarcane. (Subject No. 12 of the agenda.)

Mr. Galloway, Imperial Mycologist, was asked to introduce the subject. He said that the scheme had finished four years of its existence and had a year to run. It was now thought that mosaic causes considerably less loss than other fungal and bacterial diseases and that it was possible to keep down mosaic with suitable precautions. A certain amount of academic work had also been carried out on mosaic. A handbook on the various diseases of sugarcane was under preparation including a study of the diseases not found in this country. Mosaic was now hardly a serious disease of sugarcane in Northern India and there were more serious diseases of a fungal and bacterial nature which had to be investigated and combated.

Mr. Richards supported the renewal of the scheme, as it was important for the sugarcane growing tracts. He thought, however, that it would be better to locate some of the staff at a station in the heart of the sugarcane growing tracts such as Shahjahanpur or Muzaffarnagar where there is already suitable research staff who would be in a position to collaborate. He did not make this as a proposition so much as a suggestion for consideration. Dr. Shaw pointed out that Pusa was not to be totally abandoned in favour of New Delhi but was left with a sub-station and a laboratory and that more extensive touring would enable the staff of the Imperial Institute of Agricultural Research to keep in touch with the problems prevailing in the main sugarcane growing tract, especially as the new Institute is now going to be at a more central place, *viz.*, Delhi. He was not in favour of stationing the staff in the provinces, but the suggestion made by Mr. Richards would be borne in mind for the future.

Lala Hari Raj Swarup opposed the renewal of this grant on the ground that the research had already been completed and money was needed for more urgent schemes in connection with sugarcane. The present scheme should be discontinued, or the question of renewal of this scheme may be taken up later after the experts coming out from England had reported on the various schemes.

Mr. Sethi disagreed entirely with Lala Hari Raj Swarup, as the scheme was an important one which he wanted to be continued. He thought that timely action was necessary, especially in view of past experience in connection with the various onslaughts of pests as well as fungoid and bacteriological diseases. Rao Bahadur T. S. Venkataraman said that he never thought that mosaic was a serious disease in Northern India. There had been cases where the whole cane crop had been wiped out by smut. Members would probably remember that a crop of J-36 issued from Shahjahanpur was completely wiped out by smut in one year. He thought that diseases like red rot and smut were more important than mosaic. He therefore thought that the maintenance of an expert staff was necessary to warn people in good time. He was particularly impressed with the results already obtained. It was now well-known that mosaic exists in different physiological forms. When a new cane was found, it was not easy to repeat it. If it was found infected with some disease means had to be devised to deal with the disease and for this competent staff was needed.

Mr. Sherwani thought that the results obtained during the last five years were not tangible so far as the cultivators were concerned. He thought that the funds available at the disposal of the Council should be decentralised and distributed to the provinces, for he thought that the work, if it were done provincially, would be more useful to the cultivator than if it was under the central agency. He was of the opinion that the scheme should not be sanctioned for more than two years.

The Vice-Chairman made the suggestion that a scheme of this nature was eminently one on which it would be desirable to have the opinion of the expert. The best course would be to renew the scheme for the present for a period of two years. Personally he was of the opinion that work on sugarcane diseases should form part of the permanent activities of the Imperial Institute of Agricultural Research. He recommended that the scheme should be renewed for two years and the opinion of the scientific expert from England should be obtained whether it should not form part of the permanent activities of the Imperial Institute. Dr. Shaw accepted the suggestion and thought that after that the scheme should be entirely financed by the Imperial Institute of Agricultural Research and should not be a charge on the funds of the Council.

Mr. Sherwani complained that though he received more information unasked from the Shahjahanpur and Mushari Sugarcane Stations they never got any information from the Imperial Institute. He suggested that information should be supplied for the benefit of the growers of cane and sugar factories. It was pointed out by the Vice-Chairman that a handbook dealing with the diseases of the cane was in the press and that all results were published in the Agriculture and Livestock in India or the Indian Journal of Agricultural Science but he agreed with the suggestion of Mr. Sherwani to do every thing possible to disseminate information about the diseases of cane. He agreed to provide free of charge separate reprints of the articles dealing with cane diseases to all sugar factories who asked to have their names put on the list. In conclusion the Committee decided unanimously that the scheme should be renewed for two years.

APPENDIX VII-B.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 5th June 1936, on Subject No. 8-C (ii) :—Application from the Government of Bombay for a grant of Rs. 4,24,400 spread over five years for the continuance of the sugarcane research scheme in Bombay-Deccan.

Attention is invited to the attached note, dated the 16th March 1936, circulated to the Sugar Committee (Enclosure). The recommendations of the Committee will be submitted for consideration of the Board in due course.

ENCLOSURE.

NOTE BY THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, DATED THE 16TH MARCH 1936, ON SUBJECT NO. 13 OF THE AGENDA OF THE SUGAR COMMITTEE, JULY 1936 :—APPLICATION FROM THE GOVERNMENT OF BOMBAY FOR RS. 4,24,400 SPREAD OVER FIVE YEARS FOR THE CONTINUANCE OF THE SUGARCANE RESEARCH SCHEME IN THE BOMBAY-DECCAN.

At its third meeting held in August 1930, the Sugar Committee discussed the question of sugarcane research in the Bombay-Deccan with reference to the special needs and problems of the Deccan canal area and passed the following resolution :—

> "That the Committee recommends that arrangements be made, which can be expanded and fitted into a general scheme of agricultural research as proposed by the Director of Agriculture, Bombay, for an immediate and co-ordinated attack under unified control of the main problems connected with sugarcane in the Deccan, namely, soil management, the production of better varieties and physiology of the sugarcane plant and to await detailed proposals from the Bombay Government."

Detailed proposals involving an estimated cost of Rs. 5,22,088 spread over five years, out of which the Government of Bombay promised to meet Rs. 1,30,850 as their contribution, were accordingly submitted to the Council and were sanctioned by the Governing Body in June 1931. The scheme was started with effect from the 6th June 1932, and progress reports on the working of the scheme up to 1933-34 were considered by the Committee at its meetings held in March 1933, and July 1935. The report for 1934-35 is being placed before the Committee as a separate item on the agenda. Since the scheme was sanctioned, the Government of Bombay found it necessary to carry out certain modifications in the details and the attached statement (Annexure I) shows the position of the scheme as originally sanctioned and ultimately modified to suit actual requirements. The progress reports mentioned above will show that good work is being done.

2. The Government of Bombay have now submitted proposals (Annexures II—V) for an extension of the period of the scheme for five years from the 6th June 1937 when the present sanction expires. These include the addition of two sub-stations on the Nira Right Bank Canal

and the total cost involved is Rs. 4,24,000 (Annexure V) out of which the local Government propose to contribute Rs. 1,25,000. The cost of the two sub-stations is estimated at Rs. 53,500 (Annexure VI) (including non-recurring grant of Rs. 6,755) and receipts amounting to Rs. 21,000 to Rs. 25,000 are expected to be realised during the continuation period. A brief account of the work so far done and that which remains to be done is given in Annexure IV. The local Government have been authorised to extend the lease of land up to September 1937.

3. It will be noticed that both the existing scheme and the proposed extension are comparatively more costly than similar sugarcane schemes in other provinces. On the other hand the Bombay-Deccan scheme is in many respects a general agricultural scheme including soil research of importance. The present proposals are however more economical in certain respects than the existing scheme.

4. With regard to the Local Government's contribution towards the scheme, it may be stated that the view of the Advisory Board and the Governing Body of the Council is that a 50 : 50 provincial contribution should be the standard when running schemes are revived, in order that the Council's power to initiate new schemes shall not be impaired.

5. The proposals are for the consideration of the Sugar Committee. The Committee is requested to report on the technical aspects of the scheme and on the desirability of its continuance.

ANNEXURE I.

Statement showing the original and revised estimates of the existing scheme.

Item.	*Original Estimates.*			*Revised Estimates.*		
	Council's share.	Local Government's contribution.	Total.	Council's share.	Local Government's contribution.	Total.
Pay of officers and staff (*including* leave salary)	1,82,350	52,370	2,34,720	1,69,190	46,615	2,15,805
Travelling allowance ..	15,125	2,375	17,500	19,254	2,495	21,749
Conveyance allowance	18,900	..	18,900	..	..	..
Contingencies ..	1,13,050	70,000	1,83,050	1,20,938	72,214	1,93,152
Non-recurring expenditure	61,813	6,105	67,918	77,020	7,960	84,980
Total ..	3,91,238	1,30,850	5,22,088	3,86,402	1,29,284	5,15,686

Estimates of Receipts—

Original 1,16,000

Revised 35,635

ANNEXURE II.

Letter from the Government of Bombay, No. 6061-A.|28, dated the 11th January 1936.

I am directed by the Government of Bombay (Transferred Departments) to forward a letter (Annexure III) from the Director of Agriculture, No. 493, dated 20th December 1935, (with its accompaniments) regarding the extension of the period of the Sugarcane Research Scheme for the Deccan. The scheme was actually started from June 1932, but the land required for the experimental station was taken on lease for five years from 1st October 1931. The period of this lease will, therefore, expire on 30th September 1936. According to the agreement with the lessor, six months' notice is to be given about the termination or extension of the lease. It is, therefore, necessary to inform the lessor before 1st April 1936, whether the land would be required for a further period. The work done so far at the Padegaon Station, has been excellent. The Director's note on the work already done there and the problems remaining to be investigated proves conclusively the need for the extension of the period of the scheme. The Government of Bombay agree with him that the Station occupies a special and important position, dealing as it does with problems that have been regarded as difficult, and the solution of which will greatly influence the development of irrigation-farming and particularly of sugar-cane, in a large tract of the country where agriculture is naturally precarious but where the cane yields are high. They support his detailed proposals for the continuance of the scheme, at a cost of Rs. 4,24,400 (Annexure V) spread over a period of five years. They trust that the Research Council will approve them as early as possible. In case the consideration of the question is likely to take time, I am to request that the Director may be authorised to renew the lease of the land for one year more at least, in order that there may be no break in the work, especially as the requisite money can be found from the existing grants for the scheme. This is only a temporary arrangement to prevent the work of the fifth year of the existing scheme from remaining incomplete.

ANNEXURE III.

Letter from the Director of Agriculture, Bombay Presidency, to the Secretary, Imperial Council of Agricultural Research, New Delhi, No. 493 of 1935, dated the 20th December 1935.

I have the honour to invite reference to the correspondence ending with your letter No. F. 32|34-A., of 16th November 1935 (not printed), and to submit herewith proposals regarding the future of the Sugarcane Research Scheme for the Bombay-Deccan. In order to make things as plain as possible, I have attached to this letter a short note (Annexure IV) on the work done at the Padegaon Sugarcane Research Station and the work which it is proposed to do during the period 1937-42. I would request that this note be printed for the benefit of all members of the Advisory Board and should go along with the proposals regarding the scheme.

A perusal of this note will show very clearly that since the work started there have been definite gains in scientific knowledge which will be of great value in practice. The soil classification described is something new in India. It goes far beyond the existing classification by the Bombay Irrigation Department which is on the basis of depth and mechanical analysis and it indicates the possibilities of profitable exploitation of the so-called "Chopan" soil which has hitherto been regarded as unsuitable for sugarcane cultivation. The work on nitrogen recuperation dove-tails into work already done by Agricultural Chemists in this and other Provinces of India and shows some of the factors affecting the rise and fall of natural soil fertility and how to control them. The survey of dry and irrigated soils at various places indicates also other factors in soil fertility, particularly those affected by cane growing. This soil science work has laid the foundation of a rational treatment of the soil from the points of view of soil selection and treatment.

The work of the Principal Agricultural Officer and of the Crop Physiologist is complementary to this, particularly with regard to direct experiments on the application of water, the application of manure and the combination of variations of these. The water experiments particularly are giving exact scientific data to clear up questions which have been long under discussion between the Irrigation Department, the Agricultural Department and the growers of sugarcane in the Deccan. An exact study of the individual plant as regards its uptake of water and manure forms a still more intimate study of this important question. The note summarises the main results.

The Padegaon Sugarcane Research Station has done a great deal of work in testing varieties of sugarcane and it was thought worth while to give a complete list in this short note of the varieties tested and those retained for further study. There has been a thorough and rapid testing and elimination of the less suitable and retention of the more suitable varieties—work which needs continuation for its final and satisfactory settlement particularly as regards the canes to be recommended in different areas.

The Crop Physiologist has also been able to get valuable data regarding the effect of season and climate on the yield of cane and the production of sugar and *gul,* and has studied the effect of the soil water level on the growth of cane. The first set of factors—soil and climate—are uncontrollable, but it is very necessary to know their effects in order as far as possible to arrange to offset them by soil and water treatment and also to enable one to forecast the influence of season and climate and to evaluate their effects when looking over results of a series of past years.

This letter, however, is not intended to cover all the points mentioned in the note, and I regard the note itself as the best indication of the success of the scheme so far, and the best argument for its continuation for another five years. It is particularly to be noted that the soil of the existing Station consists of only one type of soil out of the eight that have been discovered and it is essential that the conclusions reached on this B type of soil should be tested on certain of the other types and for this purpose two sub-stations have been proposed (Annexure VI). Since the soil

factor is so important, it follows that the existing results as regards cane varieties, water and manurial treatment ought to be repeated on these other types of soils or at least on such as can be dealt with at the two sub-stations, but there is no attempt in the new proposals to provide these sub-stations with branch laboratories. All the laboratory work will continue to be done at the central and existing station at Padegaon. There has also been no attempt to propose a graduate assistant for the charge of either sub-station.

Regarding the staff of the existing station, a very considerable reduction and economy has been proposed in the abolition of the post of the Principal Agricultural Officer. I ought to state that this alteration has been proposed by the Principal Agricultural Officer himself in the interests of economy and in order that the new scheme may have the best possible chance of being favourably considered. The Principal Agricultural Officer states, and I agree with him, that the Crop Physiologist can now control the field experiment work with the help of the Farm Superintendent and for both these latter Officers a slight increase in salary has been proposed on account of their additional responsibility. The reduction of the post of the Principal Agricultural Officer makes a very big saving, namely, Rs. 59,234 in the proposals for the next five years. The detailed budgets are given as appendicies (Annexure V) to this scheme.

The need to take some decision on the proposals now put before the Imperial Council of Agricultural Research is urgent for the following reasons.

The scheme was actually started from June 1932, but the land for the experimental station was taken on lease for 5 years from 1st October 1931. The five years' lease therefore expires on 30th September 1936. According to the agreement, the lessor has to get six months notice as to our future proposals. That is to say, prior to 1st April 1936, the lessor must be informed as to whether we want the land for a further period or not. I should like to be in a position to inform the lessor before 1st April 1936 that we shall require the land for another five years. But if this is not possible I should like *in any case* to have permission to inform him that we shall want the land for at least one year, *i.e.*, up till October 1937, if only to complete the work on the cane which will be planted in January 1936. The scheme started officially from June 1932, but the first cane crop was planted in January 1933. The second was planted in January 1934, and the third in January 1935. The fourth crop, which will be the last under the existing scheme will be planted in January 1936. The extension of this lease will not involve any expenditure beyond that which has already been sanctioned by the Imperial Council of Agricultural Research and I would therefore urgently request permission to inform the lessor before 1st April 1936, that the ground will be required for at least a year more, *i.e.*, October 1936 to October 1937. This, however, is only a temporary arrangement to prevent the work of the fifth year of the existing scheme from being incomplete. What I really desire is the extension of the scheme for five years, *i.e.*, up till 1942. If the Advisory Board is good enough to pass this scheme I would suggest that the Governing Body may deal with it by circulation in order to let the Bombay Government have their decision as soon as possible.

As regards the Bombay Government's contribution, I would point out that at present this amounts to Rs. 1,29,285 for the first five years (1932-33 to 1936-37) inclusive of the non-recurring expenditure of Rs. 7,960 and the new scheme if this arrangement is continued with the modifications proposed, the Bombay Government's contribution will be Rs. 1,25,000.

In conclusion, I may be permitted to quote from a paper entitled "Indian Sugar Industry" by Mr. B. C. Burt, Expert Adviser, Imperial Council of Agricultural Research, read to the Royal Society of Arts on the 31st May 1935, in which the following passage occurs :—

> "Grants were made which enabled cane-testing and research stations to be opened throughout the main sugar-cane belt of Northern India, *viz.*, at Jorhat in Assam, Dacca in Bengal, at Mushari (near Muzaffarpur) and at Patna in Bihar, at Muzaffarnagar (in addition to extensions at Shahajanpur) in the United Provinces, and at Jullundur and Lyallpur in the Punjab. Similar experimental stations were added at Padegaon in the Bombay-Deccan, and near Chittoor and at Anakapalle in Madras. A special grant for breeding work on thick canes was made to the Mysore Agricultural Department. *The chain of experimental stations is a most important feature.*"

I would like to suggest that in this chain the Padegaon Experimental Station occupies a special and important position, dealing as it does with problems that have always been regarded as difficult, but whose solution will greatly influence the whole development of irrigation-farming and particularly that of sugarcane in a large tract of country where agriculture is naturally precarious but where cane yields are high. These reasons were gone into in great detail before this station was founded. The same reasons hold good now and I suggest that the work done by the station up to date has strengthened the arguments for the existence of the station and for its continuance. I think that a dispassionate survey of the work done and the work remaining to be done will indicate clearly that an extension in the manner proposed will carry the investigations to a stage where results are really nearer finality and where the applicability of these results will have been tested over a much wider part of the canal area in question.

Apart from the undoubted value of the work of the station to sugarcane cultivation itself, I would like to stress the fact that we have at Padegaon the first application of new soil knowledge to the study of Indian soils. I refer particularly to the work on soil colloids done by the Soil Physicist and to the new classification of soils which he has worked out in the Deccan. This knowledge and the methods worked out for such soil study are likely to be applicable to a large part of Peninsular India extending over parts of the Central Provinces, Hyderabad State and the north of the Madras Presidency, as well as a large part of the Bombay Presidency where the work is being done. The work on plant physiology, on water and manurial requirements, on the effect of climate and sub-soil water is such as to give pointers for similar work on any crop in any area. Moreover, the experimental technique using the latest statistical methods which has been employed for all the field experimentation is a model for similar work on any crop and is also a guide as to the limitations of the method.

Taking all the above facts into consideration, I trust that the Imperial Council of Agricultural Research will see its way to sanction the proposals.

ANNEXURE IV.

A SHORT NOTE ON THE WORK DONE AT PADEGAON SUGARCANE RESEARCH STATION AND THE WORK WHICH IT IS PROPOSED TO DO DURING THE PERIOD 1937-42.

The following is a very short account of what has been accomplished and what remains to be done at the Sugarcane Research Station, Padegaon, Bombay Presidency. This synopsis does not replace the annual reports, to which reference should be made for all details.

(1) *Work on Soil.*—The main result has been an entirely new classification of the soils of this area. Previous work by the Irrigation Department had classified the soils purely on depth and mechanical analysis. The classification done by the Soil Physicist has been based on the Russian system which has been lately adopted universally in which the vertical section of the soil or the *soil profile* is taken as the unit of study. The soil profile is usually characterised by successive layers or *soil horizons* differentiated from each other by colour, texture, structure or concretions. It is now realised that in the soil profile is found the complete expression of the *genetic* or soil-forming processes and hence an examination of only the surface soil is not sufficient as a basis of soil classification as followed in previous systems.

The classes determined in this research are alphabetically named A to H. The characteristics of these types are given below :—

(1) *Type ' A '.*—It is a highly colloidal soil of medium depth—2—4 ft. and very well drained, as can be perceived after a heavy shower. The soil does not crack violently even when very dry. It is well supplied with the plant food ingredients and is retentive of humus. Due to its high colloid content it is likely to respond to heavy dressings of manures and has very little chance of deterioration under irrigation as the soil reaction is lowered under such condition.

(2) *Type ' B '.*—This is a thoroughly leached soil (SiO /Al O) ratio being less than 2, poor in colloid both inorganic and organic. The oxygen giving power (as tested by Aloin) extends to the first horizon (0—24 inches) and is therefore not unsuitable for the proper development of sugarcane roots. The drainage is not bad and the moisture retentive power is good and hence quite suitable for dry crops as well. As the soil is compacted, cultural operations are found to be beneficial in the way of proper aeration and nitrification. Farmyard manure gives poor response but phosphatic manures give promising results. The soil is 2½ to 5 ft. in depth.

(3) *Type ' C '.*—The soil is very sticky and impermeable to water due to horizontal stratification which intensifies with depth. It retains moisture over a very long time and is suitable for dry crops. There is risk in irrigating this soil as it turns alkaline and loses humus heavily on irrigation. It is characterised by low potash content. Interculture and frequent ploughing are likely to be useful as antidotes to bad aeration. The depth varies from 3 to 5 ft.

(4) *Type 'D'*.—It is a very well-drained soil usually of 1 to 3 ft. in depth. The soil dries up very quickly and is unsuitable for dry crops. The soil is well aerated and responds readily to heavy dressings of organic manure. It is also very suitable for irrigation agriculture as the soil reaction is lowered under such conditions.

(5) *Type 'E'*.—The soil has a compacted 'B' horizon at a depth of one foot or so which hinders the penetration of roots and also the circulation of water. The surface soil is however very friable and is unable to retain much moisture and is therefore practically useless for dry crops unless properly managed. The rain water however drains very well over the surface of the 'B' horizon which is usually very sloping. The soil is very well supplied with N, P and K but turns alkaline under perennial irrigation. The depth varies from 2 to 8 ft.

(6) *Type 'F'*.—It is a very shallow soil, well-drained about 1—1½ft. deep divided into two horizons, the top 0—8″ being very porous in contrast to the second layer which is perceptibly stickier and more retentive of moisture. Bulky manures are essential for the proper development of this oil. Shallow ploughing is advocated (0—8″) which should not disturb the second horizon. Although this soil is shallow, due to the clayey second layer, heavy watering is not required.

There is an area of about 40 miles in length and 6 milles in breadth which consists of 'B' type soil and the Padegaon Research Station is situated in this area, and consists entirely of 'B' type soil. This fact is one of the reasons for the proposal that the work must now be done on other types by means of sub-stations.

Further, soils which are unsuitable for irrigation (*viz.*, types C, E and F) under the present system, require further investigations in the way of suitable rotations and manuring in order to keep down the alkalinity under perennial irrigation. A most important result achieved in connection with soil classification is that the so-called ***chopan*** soil which has up to now been regarded as useless for sugarcane cultivation need not be so regarded. This type of soil which is found in very large areas in the canal zones of the Bombay-Deccan, is ill-drained and puddles very badly on irrigation. It has since been identified by the Soil Physics Section at Padegaon to be one of the well-known types of alkali soil (similar to an immature "solonetz" soil according to the Russian method of nomenclature) rich in exchangeable sodium, reclamation methods of which are already well established and which have also given promising results in the farm experiments. As these soils are potentially very fertile, reclamation of these soils will bring large areas of neglected lands under sugarcane cultivation.

The Soil Physicist has also carried out soil fertility studies. These are really an examination of the way in which soil has deteriorated under cane growing from the point of view of crop yielding power and the associated changes in the soil properties under such conditions. Although deterioration is not an inevitable result of irrigation, the causes of soil damage are more numerous than the two that have been recognised up till now, namely, water-logging and salt efflorscence. Investigations

during the last three years have shown that soils may deteriorate due to (*i*) high C : N ratio in the soil (*ii*) sodium colloid formation (*iii*) hydrogen colloid formation of which the factor (*i*) may be held responsible for one third of the total damage under irrigation. Further work is necessary to evolve methods of reclamation of these spoilt soils.

In the course of examination of great many areas on the Nira Left Bank and Godavari canals, the following physico-chemical properties of soils were studied both under irrigated and dry conditions of each place, (1) *p*H, (2) total soluble salts, (3) humus, (4) nitrogen, (5) carbon and C : N ratio, (6) base saturation capacity (colloid), (7) exchange sodium and per cent, saturation with sodium, (8) colloidal mechanical factor (tilth), (9) $CaCO_3$ content and (10) rate of increase in electrical conductivity (fertility index) of which Nos. (4), (5), (6) and (9) have given the following indications :—

I Nitrogen status of soils is usually raised by cane growing and the C|N ratio is kept below 15.0 unless the soils show signs of deterioration (gradual fall in the yield of cane).

II Total base saturation capacity is increased under cane growing thus showing inherent improvement of soils.

III Cane growing deprives the soils of enormous amount of lime (equivalent to 8,400 lbs. $CaCO_3$ per acre ft. of soil per year of cane grown) and unless the soils are well supplied in respect to this ingredient there is grave risk in bringing such land under irrigation. These results are being further corroborated by farm experiments under controlled conditions where the important inter-actions of cane growing, namely, of (*i*) water, (*ii*) manure, (*iii*) continuous cane, (*iv*) fallows and rotational crops (other than cane) on the soil, are studied in separate series of plots. Here, interesting indications have been obtained with regard to (*i*) recuperation of nitrogen under different systems of fallows and their differential behaviour in different soils, and (*ii*) the possibility of replenishing the nitrogen and humus of soils by means of weed burying and selective green-manuring (*i.e.*, burying of leguminous weeds such as *Anysicarpus belgaumensis*). With respect to the changes in the soil properties Nos. (1), (2), (3), (7), (8) and (10) under irrigation, nothing definite can be said with the data at present, probably because soil types play an important part in influencing them (*cf.* differential response of soil types to irrigation with respect to *p*H total salts and humus, *vide* annual report 1934-35, p. 6). Further a very large number of reliable samples distributed over a wider range of soils is to be examined before any statistically significant result can be had.

The continuation of the work is therefore necessary for the correlation of the genetic soil classification and soil fertility studies, in order to forecast the behaviour of different soil types under different treatments and to try out rotations which appear to be most suitable for particular soil types in order to maintain their original fertility.

(2) *Improved varieties of cane.*—At the time the scheme was started, some selections of ennobled canes, which were bred at the Imperial Sugarcane Breeding Station since 1926, were available for trial. It was decided to give a rigid trial to selections from the Second Cane Breeding Officer together with the other material from the Imperial Sugarcane Expert and from Hebbal, Mysore. In the Deccan, the cane is planted at three different seasons during the year (1) January, Feburay, (2) July, August, and (3) Octber and November—and the cane varieties commonly grown by the factory and cultivator were P. O. J. 2878, E. K. 28, Co. 290 and Pundia. With the new arrivals, the following policy of testing was adopted.

(1) Acclimatization and multiplication.

(2) Replicated testing in comparison with the existing varieties (mentioned above).

For (1) two years period and (2) three years period have been fixed.

The following is a list of cane selections received since 1931-32 :—

Consign-ment No.	Year of arrival.	Serial No.	Seedling No. or name of variety.	Received from	Remarks.
1	1931-32	1	Co. 358	N. L. Dutt, Second Cane Breeding Officer, Coimbatore.	
		2	Co. 360		
		3	Co. 361		
		4	Co. 362		
		5	Co. 363		
		6	Co. 364		
		7	Co. 365		
2	1932-33	1—16	Co. 400 to Co. 415	Ditto.	
3	1933-34	1	Co. 416	Ditto.	
		2	Co. 417		
		3	Co. 418		
		4	Co. 419		..

Consignment No.	Year of arrival.	Serial No.	Seedling No. or name of variety.	Received from	Remarks.
		5	Co. 351	Government Sugarcane Expert, Coimbatore.	
		6	Co. 352	Government Sugarcane Expert, Coimbatore.	
		7	Co. 353	Government Sugarcane Expert, Coimbatore.	
		8	Co. 355	Government Sugarcane Expert, Coimbatore.	
		9	Co. 356	Government Sugarcane Expert, Coimbatore.	
		10	Co. 357	Government Sugarcane Expert, Coimbatore.	
		11	H.M. 320	Dr. V. K. Badami, Hebbal, Mysore.	
		12	H. 606	Dr. V. K. Badami, Hebbal, Mysore.	
		13	H. 607	Dr. V. K. Badami, Hebbal, Mysore.	
		14	H. 608	Dr. V. K. Badami, Hebbal, Mysore.	
		15	H. 609	Dr. V. K. Badami, Hebbal, Mysore.	
4	1934-35	1—12	Co. 420 to Co. 431	N. L. Dutt, Second Cane-Breeding Officer, Coimbatore.	
		13	Co. 313	Government Sugarcane Expert, Coimbatore.	
		14	Co. 354	Government Sugarcane Expert, Coimbatore.	
		15	Co. 381	Government Sugarcane Expert, Coimbatore.	
		16	Co. 508	Government Sugarcane Expert, Coimbatore.	
		17	Co. 513	Government Sugarcane Expert, Coimbatore.	
5	1935-36	1	Co. 432	Second Cane Breeding Officer, Coimbatore.	
		2	Co. 434	Second Cane Breeding Officer, Coimbatore.	
		3	Co. 435	Second Cane Breeding Officer, Coimbatore.	
		4	Co. 436	Second Cane Breeding Officer, Coimbatore.	
		5	Co. 270	Government Sugarcane Expert, Coimbatore.	
		6	Co. 331	Government Sugarcane Expert, Coimbatore.	
		7	Co. 516	Government Sugarcane Expert, Coimbatore.	

The main points on which the selection is based for retaining a variety are as under—

(1) Efficient root system from the standpoint of securing maximum value from fertilisers applied to the land.

(2) Stooling capacity and character of resisting adverse season.

(3) A fair immunity to pests and diseases.

(4) Tendency to less shooting and forming pith incident to arrowing.

(5) Ease of stripping or trashing.

(6) Early or late maturity and keeping quality in the field after maturity.

(7) High sucrose.

(8) Tonnage.

As a result of the past three years' work, the varieties that did not stand the above test were to be naturally rejected and only the following varieties have been retained in two different stages of test.

I. Acclimatisation and multiplication. (Small-scale non-replicated trials.)

The following varieties received in 1934-35 and 1935-36 are under this test.

Co. 420, Co. 422, Co. 423, Co. 424, Co. 425, Co. 427, Co. 428, Co. 430, Co. 432, Co. 434, Co. 435, Co. 436, Co. 270, Co. 313, Co. 331, Co. 354, Co. 381, Co. 508, Co. 515 and Co. 516.

II. Replicated test.

The following varieties are under this test.

First lot (in six replications)—Co. 360, Co. 402, Co. 412, Co. 413, Co. 419, H. M. 320.

Second lot (in three replications)—Co. 410, Co. 414, Co. 416, Co. 417, Co. 418, Co. 421, Co. 426, Co. 429.

Third lot (in three replications) early canes and sorghum hybrids—Co. 407, Co. 408, Co. 411, Co. 351, Co. 352, Co. 353, Co. 355, Co. 356, Co. 357.

Amongst the three lots mentioned above, Co. 360, Co. 419, H. M. 320, Co. 413, Co. 412, Co. 414, Co. 416 and Co. 417 are in the forefront and their special characteristics are described below :—

Co. 360—Vigorous growing, slightly lodging tendency with a full growth, root system not the best but superior to Pundia and other varieties from feeding point, mid-late, trashing not free, flowering, good tonnage with high sucrose.

Co. 419—Excellent habit of growth and root system, flowering, early ripening cane, high tonnage and high sucrose.

Co. 413—Good habit and root system, mid-late cane, flowering, good tonnage and high sucrose.

Co. 412 and Co. 414—Good habit of growth and root system, flowering twelve months cane with good tonnage and high sucrose.

Co. 416—Good habit of growth and root system intensity of flowering rather less when compared to others, mid-late to late in maturity, high tonnage with low sucrose.

Co. 417—Good habit of growth and root system, flowering, fairly high in tonnage and sucrose.

H. M. 320—Non-flowering, good growth but weak root system, tendency to lodging heavily, late, high tonnage with low sucrose.

Out of the lots mentioned, only Co. 360 and H. M. 320 have completed their second stage trial and the rest will be under trial as they were received. It would be essential to study the intake of nutritive element by the most promising varieties, which will be taken up later on when the varieties are finally selected.

The work under Soil Physics has shown the variety of soil types and the same is found to be associated with the intensity of rainfall distribution from canal to canal during the grand period of growth of cane and hence it is essential to have the successful varieties tested on different soil types throughout a series of consecutive years thus sampling both soil and season. Manure and water treatments will be standardised.

(3) *Water Requirement of Cane.*—In the Deccan canal tract owing to scanty rainfall 70 per cent of which falls in the months of September and October, sugarcane is grown under irrigation throughout its whole life cycle. It has been found that this tract is capable of producing very high tonnages and with the assured supply of water by means of the canals it is very suitable for the intensive cultivation of sugarcane. One of the effects of this assured supply at command has been a tendency on the part of the cultivators to utilise the water injudiciously which, both from the standpoint of its cost and its possible deleterious effect on crop and soil, required thorough investigation. A great deal of field experimental work had been therefore carried out for a number of years at Manjri, but the results had been very variable and inconclusive and it was found that in the absence of any knowledge of the full performance of plant activities in relation to the three main factors—climate, water food—and the inter-action of these factors or in other words in the absence of the knowledge of the physiological behaviour of the crop, no conclusive results could be obtained in order to evolve practical methods for the judicious utilisation of costly water. The experience of the Manjri work has been however very valuable in laying down field experiments on this problem at Padegaon, where all the defects in the previous work have been eliminated.

This important subject of the water requirement of cane is being studied for the last three years by three types of experiments, *viz.*, (*a*) in pot culture, (*b*) in the field on a replicated system with definite quantities of water measured accurately by meter and taken to the plots directly through pipes without loss by seepage on the way, (*c*) in the field to study the wilting coefficient. Two varieties—Pundia and P. O. J. 2878—one non-flowering and the other flowering are under study. In the (*b*) field experiment, the quantities of water experimented with are 70, 95, 120 and 130 acre inches with 150 lb. nitrogenous top dressings. The pot culture experiment is also run on similar lines, while in the wilting coefficient series, periodical stoppages of water during summer till permanent wilting of the crop are compared with 8, 10 and 15 days irrigations during the summer period. Except pot culture all other experiments have completed two years cycle and are just passing through the third year.

The investigation on the physiological response of the crop has indicated that climatic conditions particularly atmospheric humidity have a tremendous effect both on the water requirement of the plant and on its yield. The three seasons under investigation have shown distinct variability among themselves, which has produced pronounced variation in the physiological behaviour of the plant both as regards its water and mineral intake. The Deccan canal tract seems to be characterised by extreme vagaries of nature and under these circumstances it is felt that with such few years' data on hand no final conclusions could be drawn without giving them a thorough trial for a number of seasons. The bioclimatic study thus forms a very important part of the physiological investigation, and in order to get a thorough idea of the crop response, it would require to be carried out for sufficiently long period.

The sub-soil water level appears to be another factor to produce a considerable effect on this problem, and alterations by the irrigation authorities in the way in which the water is allowed in the canals, have reduced the sub-soil water level, and have made considerable differences in the reaction of the crops to watering. It is felt, that movement of sub-soil water within certain depths would be conducive to optimum growth, and it is proposed to follow up further the behaviour of the crop with differences in the sub-soil water level.

The replicated field experiment (*b*) has shown no statistically significant differences in yield between the treatments of 70, 95 and 120 acre inches for the last two seasons, and on these results 70 acre inches would be considered to be a sufficient quantity for the crop requirement. On the other hand the pot culture and the soil moisture studies in the field before and after irrigation as well as the periodical physiological behaviour of the plant have given definite indications that (1) in case of adverse climatic conditions during the intervals between irrigation and low sub-soil water level the soil moisture would fall nearly to the wilting coefficient, resulting in the temporary wilting of the crop. (2) Under such circumstances the irrigational dose per irrigation (1.5″) in 70″ treatment would fall too small to bring the soil moisture in the root zone to its field-water holding capacity. This would result in continuous low availability of water to the crop leading to its prolonged temporary wilting which would be only corrected by a shower of rain and (3) the wilting coefficient experiment (*c*) has further shown that temporary wilting for a number of times is greatly deleterious for the crop growth. It is therefore felt that under these conditions 70″ would definitely fall short of the water requirement of the crop, and such indications have been in fact obtained in the current season when during the early grand period stage the soil moisture fell too low many times, resulting in the temporary wilting of the crop. This is found mainly due to fall in the sub-soil water table coupled with the adverse climatic conditions such as low humidity and high wind velocity during the period. As a result low physiological activity, is observed and significantly low yields are expected. Among the varieties, P. O. J. 2878 is able to stand this condition much better than Pundia which is found to be due to its more efficient root system.

The soil moisture studies have further shown, that from the soil which has attained its field-water holding capacity, the loss both by evaporation and transpiration during the ten days interval between the irrigational turns comes to the optimum of 24 acre inches during the grand* period stage, and this is only slightly exceeded in the flowering stage. This quantity equals the periodical dose of 95″ treatment, and it is felt, any excess dose would be therefore leached down to lower depths. This is found to be the case in 120″ and 130″ treatments, where moisture percentages before and after irrigation generally equal that of 95″. It, therefore, seems that 95″ would be the optimum requirement of the crop, which is further confirmed by similar physiological performance in higher treatment of 120″. It wuold be necessary to test this finding in a replicated field trial in combination with different quantities of manure.

The deleterious effect of 130″ as obtained in the replicated field trials is found to be mainly due to leaching of nitrates as well as a check to the micro-biological activities in this treatment resulting in the low availability of the cake applied at earthing up time. Higher manuring with higher irrigation is thus suggested. As this treatment represents mainly the cultivators' method of irrigation, it would be quite essential to estimate the waste of both water and manure by such injudicious treatment. It is proposed to follow this by water *cum* manure experiments.

The study of the moisture relations of the crop has shown that the water requirement of cane is not the same throughout the life of the crop, being the highest during the grand period and flowering stage and lowest at the maturity stage. It would thus be seen that at certain periods a ten day interval would be thus too long while at other times it would be short. The effect of supplying water at appropriate periods according to the crop requirement remains to be experimentally dealt with. This would also be the major problem on the different soil types due to their variability in (1) field-water holding capacity, (2) water delivering power and (3) leaching down of the manurial constituents. The researches at this station which is a 'B' type soil, will have to be supplemented by sub-stations for other important soil types.

(4) *Manurial Requirements.*—A large part of the expenditure on cane growing in the Bombay-Deccan is incurred on manure and this is considered to be mainly due to the tendency of the cultivator both to over-manure and over-irrigate the crop. A great deal of field experimental work had been, therefore, carried out at Manjri to find out an economic dose of nitrogenous manure and as a result the famous standard Manjri method was evolved. It was, however, found that the dose of 150 lb. N as recommended in this method, though of very great use in periods of economic depression, does not appeal to the cultivators in normal time as he is not able to get as high yields with this dose as he is used to with his system. What he wants to know is the optimum requirement of the crop and it was felt that this problem could not be successfully tackled by field experimentation only without the fundamental investigation on the demand of the plant for differentiations and their periodical intake as well as the availability of mineral nutrients and the inter relationship of water to manure in the

*The term grand period stage connotes a stage of rapid growth in the life of the plant. For January-planted cane this stage is usually from May to September.

soil. The importance of this problem is now greater on account of the establishment of factories which grow their own cane and must get the maximum yield from the areas at their disposal. A comprehensive physiological programme has been, therefore, laid down for this important investigation and includes both field experiments as well as sand and water culture studies. The effect of the manurial treatments on the quality of juice and *gul* are also under investigation. In addition the findings of the work at Manjri are tested in statistically replicated trials with two varieties Pundia and P. O. J. 2878 in the following experiments—

(*a*) 150 lb. N in top dressing with *sann* as basic manure in comparison with lower doses up to 75 lb. N and higher doses up to 200 lb. N.

(*b*) Different doses of farmyard manure as 10, 20 and 30 thousand pounds with 150 lb. N in top dressing in comparison with lower doses of top dressings up to 50 lb. N.

(*c*) Alternative nitrogenous fertilizers as nitrate of soda, nitrate of potash, calcium cyanamide and sulphate of amonia alone in comparison with the standard Manjri method.

These experiments have completed two years cycle and are running in their third year. The results have in the main confirmed the findings of the work at Manjri and have shown the inefficacy of doses below 150 lb. N. There are, however, indications that in adverse climatic conditions 200 lb. N in top dressings would prove to be the minimum dose instead of the standard 150 lb. N. The farmyard manure series (*b*) have confirmed the dose of 20,000 lb. to be the optimum. With even higher doses, no residual effect is obtained. Further, none of the alternative nitrogenous fertilezers have shown superiority over the mixture of sulphate of ammonia and cake in equal proportions as recommended in the standard Manjri method. The experiments will, therefore, be discontinued from 1936.

The physiological investigation has yielded the following interesting results :—

Nitrogen.—From the standpoint of total nitrogen intake, doses below 150 lb. N would fall definitely short of the minimum normal requirement of the crop, which is found to be about 150 lb. N depending upon the season. The study of the decomposition of cake which is applied at earthing up time according to the standard method has further shown that about 40 per cent of its nitrogen is made available during 3½ months—the active period of intake and it seems therefore that under these circumstances the standard dose of 150 lb. N would also fall a little short of the requirement of the crop. This is further confirmed by the replicated field experiments (*b*) which have brought out the inefficacy of this treatment under adverse climatic conditions. The substitution of cake by sulphate of ammonia has not improved the matter as it seems a portion of it is lost by leaching during the period. On the basis of these physiological studies, therefore, a higher minimum dose of nitrogen is suggested which is required to be tested in replicated trials in combination with varying quantities of water.

Experiment with higher doses of nitrogen up to 300 lb. has shown higher yields as well as higher intake of this constituent by the plant. It seems therefore, the optimum intake of this element has not yet been reached and it is proposed to investigate this by giving still higher doses of nitrogen.

The needs of the plant for nitrogen vary during its life, being the least during the formative stage and highest during the grand period stage. The time of the plant's main demand for nitrogen, however, does not coincide with the peak period of nitrification of the manure applied to the soil according to the standard method. This comes much earlier and as such there is a great possibility of much of this nitrate being leached down by irrigation to lower depths. It has been also found that germination is greatly accelerated by the application of a small dose of sulphate of ammonia at planting. Further experimentation is, therefore, necessary on the giving of nitrogenous top dressings spaced at different periods along the plant's life. This would also be an important problem for different soil types when the inter-relationship of water to manure will have to be studied both from the points of leaching as well as its availability. The work of this station which is on "B" type will have to be, therefore, supplemented by similar work on sub-stations on other important soil types.

There seems to be a definite varietal characteristic as regards the physiological response to the nitrogenous treatments. It is found that while P. O. J. 2878 is capable of taking its requirement from very low concentrations of available N (75 lb. N treatment) and at the same time shows normal development in higher concentration (300 lb. N treatment), Pundia is greatly circumscribed in its activity and is adversely affected by higher concentration of soil nutrients. It would be necessary to find out optimum concentration for the varieties in order to adjust the ratio of sulphate of ammonia to cake in higher doses.

The form in which the plant takes its nitrogen requirement has also been under study. These have given promising results and have shown that the cane plant prefers ammonia to nitrates resulting in better growth. The necessity of finding out suitable methods to increase the availability of ammonia is envisaged.

Phosphorous.—Though from the standpoint of the intake this constituent comes last it has been found by field experimentation that from the manurial standpoint this is really as important an element as nitrogen and its application requires to be standardized in relation to nitrogen. The extension of this work to different soil types would also be essential.

Potassium.—There is a tremendous intake of this element being about four times that of nitrogen. The soil type under investigation is, however, found to contain enough of this element and it should not be a limiting factor in the near future.

Calcium.—From the standpoint of the availability of this constituent in the soil, this element would not be a limiting factor for a large number of years.

All this up-to-date varietal differences in manurial requirements have been carried out in Pundia and P. O. J. only. It would, however, be necessary to carry out this work on other varieties as well.

(5) *Sugarcane Economics.*—It has been found that utilising new varieties and better manuring, cost can be reduced and yield can be increased. The working of this out on a definite scheme needs further experimentation.

ANNEXURE V.

TABLE I.—*Abstract Budget Estimates for the extension period of 5 years, 1937 to 1942.*

Serial No.	Main station.	Main station.							Sub-Station.	
	Name of Sub-head.	6-6-37 to 28-2-38.	1938-39.	1939-40.	1940-41.	1941-42.	1-4-42 to 5-6-42.	Total.	1937 to 1942.	Grand total.
1	Pay of Officers	13,107	18,621	19,745	20,885	22,025	5,908	1,00,291	..	1,00,291
2	Pay of Establishment ..	15,043	21,121	21,739	22,435	22,953	6,102	1,09,393	8,988	1,18,381
3	Leave Salary	1,650	2,200	2,200	2,200	2,200	491	10,941	1,007	11,948
4	Travelling Allowance ..	2,995	3,900	3,900	3,900	3,900	905	19,500	2,750	22,250
5	Contingencies	19,640	26,155	26,155	26,155	26,155	6,515	1,30,775	40,755	1,71,530
	Total ..	52,435	71,997	73,739	75,575	77,233	19,921	3,70,900	53,500	4,24,400

TABLE II.

***Detailed Budget Estimates** for the extension of the Sugarcane Research Scheme for Deccan, Padegaon for the period of five years from 6-6-37 to 5-6-42.*

Serial No.	Name of sub-head.	6-6-37 to 28-2-38.	1938-39.	Budget estimates.		1941-42.	1-4-42 to 5-6-42.	Total.	Date of next increment.
				1939-40.	*1940-41.*				
1	2	3	4	5	6	7	8	9	10
		Staff required in the Agricultural Section.							
	Pay of Officers.								
1	One Officer in Class II (Provincial Agricultural Service, 170—10—250, E. B. 15—400, E. B. 20—500) starting pay Rs. 240 per mensem.	2,120	2,969	3,133	3,313	3,493	935	15,963	6-6-1938.
	Pay of Establishment.								
2	One Agricultural Overseer in the grade, of 150—5—200, starting pay Rs. 150 per mensem.	1,325	1,844	1,904	1,964	2,024	539	9,600	6-6-1938.
3	One Agricultural Overseer in the grade of 105—5—140, starting pay Rs. 125 per mensem.	1,135	1,590	1,650	1,680	1,680	444	8,179	1-9-1937.
4	One Agricultural Sub-Overseer in the grade of 30—5/2—80, starting pay Rs. 65 per mensem.	575	830	840	890	900	244	4,279	1-5-1938.
5	One Agricultural Sub-Overseer in the grade of 30—5/2—80, starting pay Rs. 45 per mensem.	398	579	600	639	660	175	3,051	8-7-1938.
6	One Laboratory Assistant in the grade of 30—5/2—80, starting pay Rs. 60 per mensem.	530	758	780	818	840	222	3,948	19-7-1938.

TABLE II—*contd.*

Serial No.	Name of sub-head.	6-6-37 to 28-2-38.	1938-39.	Budget estimates. 1939-40.	1940-41.	1941-42.	1-4-42 to 5-6-42.	Total.	Date of next increment.
1	2	3	4	5	6	7	8	9	10
		Staff required in the Agricultural Section—contd.							
	Pay of Establishment—contd.								
7	**One Storekeeper in** the grade of 30—5/2—**80, starting** pay Rs. 65 per mensem.	575	793	840	853	900	238	4,199	16-12-1938.
8	**One Engine** Driver in the grade of **30—2—60, starting** pay Rs. 60 per **mensem.**	530	720	720	720	720	190	3,600	
9	**One Laboratory** Boy in the grade of **18—1/2—21, starting** pay Rs. 18 per **mensem.**	159	216	225	228	237	64	1,129	6-6-1939.
	Total of Agricultural Section ..	7,347	10,299	10,692	11,105	11,454	3,051	53,948	
		Staff required in the Soil Physics Section.							
	Pay of Officers.								
1	**One Officer in Class I,** Provincial Agricultural Service, (320—40—1,200), **starting pay Rs. 560** per mensem.	5,284	7,538	8,018	8,498	8,978	2,407	40,723	18-6-1937.
	Pay of Establishment.								
2	**One Agricultural** Overseer in the grade **of 150—5—200, starting pay Rs. 185 per mensem** ***plus*** **Rs. 20 per mensem special pay.**	1,784	2,477	2,537	2,597	2,640	697	12,732	22-11-1937.

3	One Agricultural Overseer in the grade of 110—8—150, starting pay Rs. 110 per mensem.	972	1,391	1,487	1,583	1,679	450	7,562	6-6-1938.
4	One Agricultural Sub-Overseer in the grade of 35—5/2—60, E. B. 4—100, starting pay Rs. 40 per mensem.	354	518	540	578	600	159	2,749	14-7-1938.
5	One Laboratory Boy, Rs. 18 per mensem.	159	216	216	216	216	57	1,080	
6	One Laboratory Boy, Rs. 18 per mensem.	159	216	216	216	216	57	1,080	
	Total of Soil Physics Section ..	8,712	12,356	13,014	13,688	14,329	3,827	65,926	
	Pay of Officers.	*Staff required in the Crop Physiology Section.*							
1	One Officer in Class I, Provincial Agricultural Service (320—40—1,200), starting pay Rs. 560 per mensem *plus* Rs. 50 per mensem special pay.	5,261 442	7,514 600	7,994 600	8,474 600	8,954 600	2,407 159	40,604 3,001	6-7-1937.
	Pay of Establishment.								
2	One Agricultural Overseer in the grade of 150—5—200, starting pay Rs. 175 per mensem *plus* Rs. 20 per mensem special pay.	1,723	2,395	2,455	2,515	2,575	692	12,355	1-4-1937.
3	One Agricultural Overseer in the grade of 105—5—140, starting pay Rs. 120 per mensem.	1,047	1,471	1,531	1,591	1,651	444	7,735	28-8-1937.
4	One Agricultural Sub-Overseer in the grade of 35—5/2—60, E. B. 4—100, starting pay Rs. 40 per mensem.	354	518	540	578	600	159	2,749	14-7-1937.
5	One Laboratory Boy, Rs. 18 per mensem.	159	216	216	216	216	57	1,080	

TABLE II—*concld.*

Serial No.	Name of sub-head.	6-6-37 to 28-2-38.	1938-39.	Budget estimates.			1-4-42 to 5-6-42.	Total.	Date of next increment.
				1939-40.	1940-41.	1941-42.			
1	2	3	4	5	6	7	8	9	10
		Staff required in the Crop Physiology Section—contd.							
	Pay of Establishment—contd.								
6	One Laboratory Boy, Rs. 18 per mensem.	159	216	216	216	216	57	1,080	
7	One Agricultural Sub-Overseer in the grade of 35—5/2—80, starting pay Rs. 60 per mensem.	530	809	840	869	900	222	4.170	6-6-1939.
	Total of Crop Physiology Section ..	9,675	13,739	14,392	15,059	15,712	4,197	72,774	
		Staff required in Office Section.							
	Pay of Establishment.								
1	One Head Clerk Accountant in the grade of 90—5/2—115, starting pay Rs. 105 per mensem.	951	1,320	1,343	1,380	1,380	365	6,739	14-10-1937.
2	One Junior Clerk in the grade of 25—5/2—55, starting pay Rs. 40 per mensem *plus* typing allowance at Rs. 10 per mensem.	369 88	540 120	555 120	600 120	615 120	175 32	2,854 600	1-12-1937.
3	One Naik, Rs. 20 per mensem ..	177	240	240	240	240	64	1,201	

7 4-6 & 8	Three peons, Rs. 18 *per mensem* each Two Watchmen, Rs. 20 per mensem each.	477 354	648 480	648 480	648 480	648 480	171 128	3,240 2,402
	Total of Office Section ..	2,416	3,348	3,386	3,468	3,483	935	17,036
	Leave salary	1,650	2,200	2,200	2,200	2,200	491	10,941
		Allowances and Honoraria.						
	Travelling Allowance	2,395	3,100	3,100	3,100	3,100	705	15,500
	Rs.							
	Agricultural Section .. 500							
	Crop Physiology Section 800							
	Soil Physics Section .. 1,400							
	Office Section 400							
	3,100							
	To attend Council meetings ..	600	800	800	800	800	200	4,000
	Total of Allowances and Honoraria ..	2,995	3,900	3,900	3,900	3,900	905	19,500
		Contingencies.						
1	Cultivation charges	10,135	13,475	13,475	13,475	13,475	3,340	67,375
2	Office Expenses and Miscellaneous ..	750	1,000	1,000	1,000	1,000	250	5,000
3	Soil Physics Section	3,750	5,000	5,000	5,000	5,000	1,250	25,000
4	Crop Physiology Section	3,000	4,000	4,000	4,000	4,000	1,000	20,000
5	Petty Construction and Repairs ..	750	1,000	1,000	1,000	1,000	250	5,000
6	Rent, Rates and Taxes	1,140	1,530	1,530	1,530	1,530	390	7,650
7	Service Postage and Telegrams ..	115	150	150	150	150	35	750
	Total of Contingencies ..	19,640	26,155	26,155	26,155	26,155	6,515	1,30,775
	GRAND TOTAL ..	52,435	71,997	73,739	75,575	77,233	19,921	3,70,900

TABLE III.

Statement showing the budget estimates on account of the Bombay Government contribution towards the Sugarcane Research Scheme for a period from 6th June 1937 to 5th June 1942.

Serial No.	Name of sub-head.	6-6-1937 to 28-2-1938.	Budget estimates.				1-4-1932 to 5-6-1942.	Total	Remarks.
			1938-39.	1939-40.	1940-41.	1941-42.			
1	2	3	4	5	6	7	8	9	10
	I. *Pay of Establishment*—								
1	Agricultural Overseer in the grade of 105—5—140, pay Rs. 140.	1,237	1,680	1,680	1,680	1,680	444	8,401	
2	Agricultural Overseer in the grade of 105—4—140, pay Rs. 120.	1,047	1,471	1,531	1,591	1,651	444	7,735	
3	Agricultural Overseer in the grade of Rs. 105—5—140, pay Rs. 125.	1,135	1,590	1,650	1,680	1,680	444	8,179	
4	One Agricultural Sub-Overseer in the grade of Rs. 30—5/2—80, pay Rs. 65.	575	830	840	890	900	244	4,279	
5	One Agricultural Sub-Overseer in the grade of Rs. 30—5/2—80, pay Rs. 45.	398	579	600	639	660	175	3,051	
6	One Agricultural Sub-Overseer in the grade of Rs. 30—5/2—80, pay Rs. 60.	530	809	840	869	900	222	4,170	

7	One Laboratory Assistant in the grade of Rs. 30—5/2—80, pay Rs. 60.	530	758	780	818	840	222	3,948
8	One Engine Driver in the grade of Rs. 30—2—60, pay Rs. 60.	530	720	720	720	207	190	3,600
9	One Laboratory Boy at Rs. 18	159	216	216	216	216	57	1,080
10	One Store-keeper in the grade of Rs. 30—5/2—80, pay Rs. 65.	575	793	840	853	900	238	4,199
	Leave Salary	600	800	800	800	800	183	3,983
	Total Pay of Establishment ..	7,316	10,246	10,497	10,756	10,947	2,863	52,625
	II. Travelling allowance	360	475	475	475	475	115	2,378
	III. Contingencies	10,500	14,000	14,000	14,000	14,000	3,500	70,000
	GRAND TOTAL ..	18,176	24,721	24,972	25,231	25,422	6,478	1,25,000

Explanatory notes on the budget of extension from 1937-1942.

1. In the agricultural section, the post of the Principal Agricultural Officer which is in Class I and which would have cost the scheme Rs. 59,234 has been omitted for reasons stated, and a Class II officer in the agricultural section has been proposed with a starting pay of Rs. 240. It is proposed to give the present Agricultural Overseer (Mr. V. N. Apte, who will be drawing Rs. 175 + 30 in June 1937) the starting pay of Rs. 240 as he will have in addition to his existing work, the responsibility of looking to major general administration under the Crop Physiologist who will be in charge of the whole scheme.

2. In the establishment, it is proposed to give the Agricultural Overseer who has been drawing Rs. 140, a grade of Rs. 150—5—200 from 1937 June. He has been on his present maximum for five years since March 1933. So long as the Principal Agricultural Officer was looking to the varietal section, which has been standardised, the Agricultural Overseer's duties were only of a subordinate character. But henceforth he will be managing the varietal section as per new methods, and the work will thus be of a much increased responsibility. Hence it is proposed to give him the above grade. Even though the old grades are non-existent, yet, so long as the scheme continues, this should be a special grade in the scheme.

3. When compared to Manjri Farm staff transferred to the agricultural section, the present subordinate staff has been reduced by one non-graduate fieldman who will be made available for work in the Crop Physiology Section in which the services of a full time Agricultural Sub-Overseer are required.

4. In the Soil Physics Section, the Senior Assistant will continue in the same grade with the special allowance which is essential. As regards the second graduate a change has been made to a new grade of Rs. 110—8—150. The present incumbent is now on the maximum of the grade since 1934 and did not get any increments. As the staff in the scheme has no benefits of G. P. Fund, as per new provident fund rules, and have no chances of being taken into the Department, and as the original post which carried 150—5—200 was reduced on account of retrenchment to 105—5—140, I feel that such temporary people with strenuous work in the scheme, require some encouragement and compensation. This graduate is fully qualified being double graduate and has to do the important colloid work which is entrusted to him.

5. In the Crop Physiology Section, a special pay of Rs. 50 has been suggested for the Crop Physiologist as he will be holding in addition to his duties the general administration charge of the whole scheme as well. He will be helped by the Agricultural Overseer (in the agricultural section Class II).

In order to meet with this additional work in his section only one additional non-graduate in the grade of Rs. 35—5|2—80 is added by transfer from the Agricultural Section. In his section this Senior Assistant is continued in the same grade with the additional allowance that has been sanctioned.

6. The second Clerk, who is an expert typist and who has a very heavy typing work of the three sections in addition to other office routine work, has suffered a loss by Rs. 10 a year owing to the introduction of the new

grade. The temporary incumbents in the scheme have no claim on a post in the permanent service, nor have any facilities of G. P. Fund or leave rules after the close of the scheme. I would recommend, therefore, that Mr. Puranik, the present holder of the post, be given a typing allowance of Rs. 10 p. m.

7. *Allowances.*—The travelling allowance actually shown is what will be essential in the performance of legitimate duties during the five years programme and not for either visits to Delhi or sub-station management if these are added to it. A separate provision has been shown in the statement in connection with the trips of officers to attend the meetings of the Advisory Board or its Sub-Committees. Similar provision for the T. A. of officers inspecting the sub-stations is made in the budget estimates for the sub-stations.

8. *Contingencies.*—As stated in the main draft, the actual area under cane will be reduced from 26 acres to about 16 acres. In order to manage this the continuance of the whole area already taken—105 acres will be necessary as it is laid down for permanent experiments of the Soil Physicist and Crop Physiologist which cannot be changed. Similarly the blocks laid down and the observation on sub-soil water which have been permanently laid down cannot be given up as they form parts of the main work of the scheme for the next five years. As a result of the proposed reduction of the cane area, a piece of land will remain fallow, as no provision in contingencies has been made. The cultivation charges are reduced to the requirement of the cane area of 16 acres.

The Crop Physiologist's contingencies have been increased to Rs. 4,000 from Rs. 3,000 as the actual past three years' expenditure has shown that this sum is quite essential. The original beudget was defective in this respect.

The rest of the charges shown under Office Expenses and Miscellaneous Rent, Rates and Taxes, Petty Construction and Repairs, etc., should remain as they are.

9. *Receipts.*—The actual estimated receipts of the Padegaon Research Station may amount to from 21 to 25 thousand rupees which will depend upon seaon and *gul* rate.

ANNEXURE VI.

Budget estimates for two Sub-Stations on the Nira Right Bank Canal.

The following general programme showing outlines of work will be carried at the sub-stations :—

1. Cane varietal studies.
2. Water requirement studies.
3. Manurial requirement studies.
4. Rotational studies.

The detailed budget estimates are as per attached statement. The whole work would be under the control of the scheme.

Budget estimates for five years (1937-42) of two sub-stations having area from 15—17 acres at a distance of 12 to 15 miles apart on the Nira Right Bank Canal about 50 to 60 miles from the Padegaon Research Station.

Main Serial No.	Serial No. of Item.	Item.		Amount. Cost of item and per acre.	Amount. Cost for 5 years.	Total.
I		*Establishment for two sub-stations.*				
	1	Three non-graduates (35—5/2—80) ..		1,260	7,020	
	2	One Counter (20—1/2—25)		240	1,248	
	3	Laboratory Boy at Rs. 12		144	720	
				1,644	8,988	8,988
		Leave salary		..	1,007	1,007
II		*Allowances and Honoraria.*				
	1	T. A. for members		150	750	..
	2	T. A. for inspection by the officers at Padegaon.		400	2,000	2,750
III		NON-RECURRING.				
		A.—Buildings.				
		Central.	Sq. ft.			
	1	Two Non-graduates	=800			
	2	Sample room and office	=450			
	3	Bullock shed, implement and store	=200			
	4	Four servants	=400			
		Sub-station.				
	5	One Non-graduate	=400			
	6	One Counter	=100			
	7	Two servants	=200			
	8	Bullock shed, implement room and sample room.	=320			
		Total .. at 1·5	2,870		4,305	4,305

Main Serial No.	Serial No. of Item.	Item.	Amount. Cost of item and per acre.	Amount. Cost for 5 years.	Total.
III—*contd.*		NON-RECURRING—*contd.*			
		B.—Apparatus.			
	1	Meteorological apparatus for two sub-stations.	200	450	450
	2	Water measuring devices for two sub-tions.	250		
		C.—Live Stock and Dead Stock.			
	1	One pair of bullocks	200		
	2	One bullock cart	65		
	3	Two harrows	20		
	4	Two drills	20		
	5	One plough	30		
	6	Platform weighing balance	300		
	7	Small weighing balance	30		
	8	Miscellaneous	45		
		For 2 stations	700 × 2 1,400	1,400	1,400
		D.—Layout of land.			
	1	Channel making, etc. Rs. 300 for two sub-stations	600	600	600
IV		RECURRING.			
	1	Cultivation charges .. .. =1,500			
	2	Manure 400			
	3	Irrigation 200			
	4	Rent, etc. 250			
	5	Cattle feed 125			
	6	Labour for Crop Physiology and Soil Physics sections for scientific work . 400			
	7	Service postage 25			
		2,900			
		For two sub-stations	5,800	29,000	29,000
	8	Extra glass ware and running expenses at Padegaon (all the chemical work will be one at Padegaon).	1,000	5,000	5,000
					53,500

Abstract of expenditure—

		Rs.
1. Recurring	.. ..	46,745
2. Non-recurring	.. ..	6,755
	Total ..	53,500

APPENDIX VII-C.

Supplementary note by the Secretary, Imperial Council of Agricultural Research, dated the 26th June 1936, on Subject No. 8-C (ii) :—Application from the Government of Bombay for a grant of Rs. 4,24,400 spread over five years for the continuance of the Sugarcane Research Scheme in the Bombay-Deccan.

In continuation of note, dated the 5th June 1936 (Appendix VII-B), the attached note, dated the 26th June 1936, for the Sugar Committee (Annexure), is circulated for information.

ANNEXURE.

SUPPLEMENTARY NOTE BY THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, DATED THE 26TH JUNE 1936, ON SUBJECT NO. 13 OF THE AGENDA OF THE SUGAR COMMITTEE, JULY 1936 :—APPLICATION FROM THE GOVERNMENT OF BOMBAY FOR A GRANT OF RS. 4,24,400 SPREAD OVER FIVE YEARS FOR THE CONTINUANCE OF THE SUGARCANE RESEARCH SCHEME IN THE BOMBAY-DECCAN.

In continuation of the note, dated the 16th March 1936 (Enclosure to Appendix VII-B), the Director of Agriculture, Bombay Presidency, have intimated that " the estimated receipts amounting to Rs. 8,000 have remained to be shown through oversight, at the end of the budget estimates for 5 years of the two sub-stations attached to the short note on work done at the Padegaon Sugarcane Research Station and the work proposed to be done during 1937-42 ". It is requested that necessary correction may be made in the printed copy of the scheme already circulated.

APPENDIX VII-D.

Supplementary note by the Secretary, Imperial Council of Agricultural Research, dated the 11th July 1936, on Subject No. 8-C (ii) :— Application from the Government of Bombay for a grant of Rs. 4,24,400 spread over five years for the continuance of the Sugarcane Research Scheme in the Bombay-Deccan.

In continuation of the supplementary note, dated the 26th June 1936 (Appendix VII-C), the attached extract from the proceedings of the Sugar Committee meeting held on July 8th, 1936 (Annexure), is circulated.

2. The scheme has been recommended for extension for a period of 3 years on the condition that 50 per cent. of the cost will be contributed by the Province. The Committee has also recommended that the 2 sub-stations should be dropped and that the Agricultural Officer should be retained in the scheme. The scheme as revised involves a grant from the Council of approximately Rs. 1,26,250 spread over 3 years, as shown below :—

	Rs.
Principal Agricultural Officer	34,500
Agricultural Section	31,500
Soil Physics Section	37,500
Crop Physiology Section	42,000
Office Section	10,000
Leave salary	6,500
Travelling allowance and Honoraria ..	12,000
Contingencies	78,500
	2,52,500
To be contributed by the Imperial Council of Agricultural Research	1,26,250

The provision on account of leave salary is subject to detailed examination by the Secretariat of the Council.

ANNEXURE.

EXTRACT FROM THE PROCEEDINGS OF THE SUGAR COMMITTEE MEETING HELD ON JULY 8TH, 1936.

4. *Application from the Government of Bombay for Rs. 4,24,400 spread over five years for the continuance of the sugarcane research scheme in the Bombay-Deccan. (Subject No. 13 on the agenda).*—

Dr. Burns introduced the subject and said that the data given in the printed note provided sufficient justification for extending the scheme. The proposal was put up on the basis of the recommendations of the Sugar Committee of 1930. He said that the purpose of the scheme had been fulfilled and important results had been achieved in the study of soils. Work had been carefully done on the basis of the

latest methods of experimental technique with the help of the Statistician to the Council. Water requirements and manurial problems had also been studied. He added that Mr. Walchand Hirachand got some very interesting results by getting 100 tons on one acre and 90 tons of cane on another. His results indicated the possibility of further achievements, though it was known that cane yields in Bombay are relatively higher. The question whether such a heavy yield is likely to have deleterious effects on the soil has, however, to be examined.

The Vice-Chairman pointed out that the Bombay Government promised a contribution of 1.25 lakhs to the scheme which now provided for two new sub-stations not included in the original scheme. The Council was asked to provide Rs. 2.99 lakhs for the renewal of the scheme for five years. Vice-Chairman pointed out that the scheme was previously criticised on the ground of expense. It was not purely a sugar scheme but was of general importance to Deccan Agriculture.

Rao Bahadur T. S. Venkataraman pointed out the omission of the agricultural officer from the scheme. It was not known why this was omitted, especially as the whole work depended on the agricultural officer.

Lala Shri Ram enquired why we should depart from the rule of 50 : 50 contribution from the Council and the Local Governments, especially as valuable data had already been collected in connection with the other problems of agricultural in various parts of the country. He thought that if we departed from the principle laid down by the Governing Body, we should be creating a bad precedent.

Dr. Burns said that the rule regarding 50 : 50 contribution was only the enunciation of a principle and had not even become a convention, let alone an established practice. He raised the point why this principle of provincial contribution should be applied only to extension schemes, especially when it was impossible for the provinces to make contributions for schemes of this nature. As was pointed out by Sir Bryce Burt some time ago the Padegaon Sugar Station was one of a chain and it was just as important as other links in the chain. Estimates had been cut down very considerably and so far as the contribution from the Local Government was concerned, he felt that the amount proposed to be given by the Bombay Government was the maximum that could be expected. He, therefore, felt that it was difficult to carry out the principle laid down regarding 50 : 50 frow the provinces. He, therefore, emphasised that this principle should not apply in view of the straitened conditions of provincial finances.

The Vice-Chairman said that it was now appropriate that the Sugar Committee should face the question of the policy to be followed regarding contributions from the provinces in connection with all sugar schemes. He agreed that there was no binding resolution by the Governing Body regarding a 50 : 50 contribution. But there was undoubtedly a strong feeling, however, both in the Advisory Board and in the Governing Body that provinces should contribute a definite share ordinarily 50 : 50 towards the expense of renewing their schemes. The reason was that the Council's income was not unlimited and some money was needed for new schemes.

Mr. Walchand Hirachand said that the amount of money spent by the Central Government was small compared to the amount spent by other countries and in the circumstances it was not unreasonable to hope for an increase in the grant from the Central Government, especially when the schemes had passed three or four ordeals of careful scrutiny. He pointed out that the sugarcane research was long range research and quick results could not, therefore, be expected. The Local Governments, however, were in financial difficulties and could not be expected to shoulder the burden of those renewed schemes on the basis of 50 : 50 and he thought it inadvisable to insist on rigid compliance with the principle of 50 : 50 contribution. In view of the valuable results already achieved, he thought that it would not be right to put any obstacles in the way of renewing the schemes simply because the province was not in a position to comply with the ratio of contribution decided upon by the Governing Body. He also pointed out that the principle of 50 : 50 contribution had not been insisted upon rigorously in the past.

Vice-Chairman said that even if it was not possible to insist on a strict 50 : 50 ratio the time had now come when the principles to be followed by the Sugar Committee should be laid down.

Mr. Walchand Hirachand was not in favour of any rigid ratio of provincial contribution. He suggested that every effort should be made to induce the Central Government to contribute sufficient funds for the execution of all necessary schemes.

Sir Sundar Singh Majithia was in favour of the 50 : 50 contribution in all ordinary cases with the proviso that the principle should be relaxed in special circumstances.

Mr. Hari Raj Swaroop supported the proposal of Sir Sunder Singh Majithia. He thought that it was necessary to have such a principle as otherwise the possibility of the Council undertaking new schemes of research would be seriously restricted. A large number of the schemes was generally of provincial importance and should therefore be financed by the provincial government. He thought that in this particular case of the Bombay scheme the Local Government should make greater financial contribution than what was proposed.

Mr. R. G. Allan thought that the renewal schemes should be financed, as far as possible, by the Council on the condition that Local Governments increased their expenditure on agricultural demonstrations and propaganda. The Government of India should do what they could, to forward the development of research rather than bargain with local Governments regarding the latter's contributions.

Mr. D. R. Sethi supported Mr. Allan. He thought that it would be a very sound thing if the Central Government insisted upon the Local Governments bringing at their own expense the results of research financed by the Imperial Council of Agricultural Research to the notice of the cultivators.

Lala Shri Ram said that there was some misapprehension about this matter. He thought that so far as the number of desirable schemes was concerned, it was legion. It was human nature that results which had been paid for were likely to be better appreciated.

The point having been raised that the Government of India took the excise duty, the Vice-Chairman pointed out that Government of India had already sacrificed rupees eight crores of revenue from the import duty in favour of supporting the sugar industry in the country. In other words the Government of India had already given away some part of their power to help the Sugar Committee and it must be recognised that funds were not unlimited.

Seth Haji Abdulla Haroon did not agree with the view the Vice-Chairman had taken regarding the sacrifice by the Government of India of the revenue duty.

The Chairman put Sir Sundar Singh's proposal that " when sugar research schemes are renewed, ordinarily a 50 per cent. contribution should be required from the local Government, but the Sugar Committee should be at liberty to recommend a reduction in the local Government's contribution when a special case is established ". This was carried by 11 votes against 4.

It was agreed that the attention of the provincial governments should be drawn to the desirability of making additional provision for bringing to the notice of cultivators results of research financed by the Central Government.

The Committee resumed the discussion on technical details of the schemes.

Mr. Sethi said that the schemes fell into two parts, (*a*) regarding sugar research, and (*b*) regarding soil science, and suggested that the latter part regarding the research on soil science should not be financed by the Council.

In reply to a query by Chowdhry Mukhtar Singh, the Chairman said that it would be advisable to treat the scheme as a whole. He also said that the work done hitherto in connection with the scheme, which had been inspected by him, was good.

Mr. Walchand Hirachand said the sugar factories in Deccan had done very valuable work in the matter of cane cultivation and in support of his statement he gave the outturns of sugarcane per acre in the experiments conducted on the various plots. The yields in certain plots amounted to even as much as 103 or 104 tons of sugarcane per acre. He considered that the omission of the Agricultural officer from the scheme was a piece of false economy, and was perhaps designed merely to increase the percentage of the provincial contribution. He thought that the scheme was of value of the entire country, and warmly recommended that this scheme should make an exception to the rule which was proposed by Sir Sundar Singh Majithia.

Lala Shri Ram said that so far as he understood Mr. Walchand, it was the factory owner who was going to benefit from the scheme and not the thousands of farmers.

The Chairman enquired whether the factory owners in the Bombay-Deccan numbering 6, who grew their own cane were prepared to make any direct contribution to the financing of the scheme, and whether the factory owners could not make up the 50 per cent. contribution by adding their quota to that to be made by the Bombay Government.

Dr. Shaw said that the question of renewal of the schemes financed by the Council was to be reviewed by the British Scientist who was

coming out from England and suggested that it would be desirable to restrict the renewal of the schemes to a period of 3 rather than 5 years. The sub-stations might well be financed by the Local Government or by the factories which benefited so largely out of these schemes.

Mr. Walchand Hirachand enquired the reason for the defeatist attitude, especially when they had done the research work extremely well and beyond expectations. He did not feel that the scrutiny by the British Scientist would affect the sugar schemes as he was quite [illegible] that justice had been done to the working of the schemes.

Rao Sahib Vagholkar did not favour Dr. Shaw's proposal as there were practical difficulties in restricting the renewal to 3 years only, especially when the cane crop was a 13 to 18 months crop, and when it was not possible to lease the land for a period less than 5 years. In the circumstances he thought that 5 years should be the minimum period for renewals.

Mr. Allan enquired about the real value of these sub-stations.

Rao Sahib Vagholkar explained that different soil types had been worked out at the different sub-stations. Rao Bahadur Vankataraman said that as the factories had carried out valuable cane experiments they should be prepared to place the land at the disposal of the sub-stations for testing out the soil-types ; and thought that it was not necessary to have these separate sub-stations. It would not be useful to build up more theories, but what was needed was that there should be the Agricultural Officer to guide the operations.

Dr. Burns was agreeable to the retention of the Agricultural Officer and dropping of the sub-stations. Mr. Sherwani said that in the Bombay Presidency, cane was being grown by the capitalist so that it was not proper for the Council to spend a lot of money there. Against that, cane in Northern India is grown by small growers and there was no hope in the near future of the capitalist growing his own cane. The latter will always have to depend on the cane grown by the small grower, and thus the sugar industry of Northern India was at a great disadvantage. He suggested that the capitalist himself should undertake to make investments in the sugarcane industry in the Bombay Presidency, and all the money available with the Council for the purpose may be left over for the industry in Northern India.

Dr. Burns said that too much had been made of the fact that the scheme originated from Bombay. He thought that the results obtained from the scheme were likely to be useful to the small grower also.

Mr. Sherwani said that all available funds should be spent on improving the condition of the small cultivator in Northern India and not spent in the Bombay Presidency. Dr. Burns was in favour of renewing the scheme for a period of five years. The Vice-Chairman thought that three years were sufficient. The proposition to limit the schemes for a period of three years was approved by 9 votes against 4.

Dr. Shaw's proposal to omit the sub-stations and Rao Bahadur Venkataraman's suggestion to include an agricultural officer were unanimously approved.

The question of the provincial contribution including the contribution from Government as well as from other local agencies was then voted on : 8 were in favour of a 50 per cent. contribution from the provinces in the case of renewal schemes and 2 against.

APPENDIX VII-E.

Supplementary note by the Secretary, Imperial Council of Agricultural Research, dated the 13th July 1936, on Subject No. 8-C (ii) :— Appplication from the Government of Bombay for a grant of Rs. 4,24,400 spread over five years for the continuance of the Sugarcane Research Scheme in the Bombay Deccan.

In continuation of the supplementary note, dated the 11th July 1936 (Appendix VII-D), the attached letter (Enclosure) from the Director of Agriculture, Bombay containing an amended statement of expenditure is circulated.

ENCLOSURE.

COPY OF LETTER NO. 493 OF 1936, DATED THE 13TH JULY 1936, FROM THE DIRECTOR OF AGRICULTURE, BOMBAY PRESIDENCY, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

SUBJECT :—*Sugarcane Research Scheme in the Bombay-Deccan. Continuance of——.*

I am in receipt of your supplementary note dated 11th July 1936, on Subject No. 8-C. (*ii*), " Application from the Government of Bombay for a grant of Rs. 4,24,400 spread over five years for the continuance of the Sugarcane Research Scheme in the Bombay-Deccan ", in which you give the amount of the scheme for three years as Rs. 2,52,500 (Appendix VII-D). The correct amount is now Rs. 2,48,354 as will be seen from the second statement in the attached papers. The difference is due to the fact that I have now excluded the various allowances which were to be given if the Principal Agricultural Officer had not been appointed. The figure of Rs. 2,48,354 may, therefore, be given instead of the figure 2,52,500. In order to make it easy to replace your statement by another one, I give below the figures for the various items as they ought to be :—

	Imperial Council of Agricultural Research figures. Rs.	Director of Agriculture's figures. Rs.
Principal Agricultural Officer	34,500	34,101
Agricultural Section	31,500	32,258
Soil Physics Section	37,500	37,656
Crop Physiology Section	42,000	37,548
Office Section	10,000	10,085
Leave salary	6,500	6,541
Travelling allowance and honoraria ..	12,000	11,700
Contingencies	78,500	78,465
Total ..	2,52,500	2,48,354
To be contributed by the Imperial Council of Agricultural Research	1,26,250	1,24,177 (or Rs. 1,24,200 in round figures).

NOTE DATED THE 13TH JULY 1936, BY THE DIRECTOR OF AGRICULTURE, BOMBAY.

The attached statements of budgets are prepared both for 5 and 3 years in the same form as printed on page 15 of the scheme. In these the salary of the Principal Agricultural Officer is included. The Class II Officer proposed in the original scheme is put in the subordinate grade and the proposed allowances to the Crop Physiologist have been excluded.

2. Leave salary of the Principal Agricultural Officer has not been calculated.

3. In the statement II against the serial No. 2 " Pay of Establishment " column 6, Rs. 6,826, there may be a reduction of about Rs. 300 to 400, as exact figures of increments to subordinate staff are not available here in Simla.

4. Correct estimates will be submitted later, if required.

STATEMENT NO. I.

Abstract of budget estimates of the extension period for 5 years 1937—42 wherein the Principal Agricultural Officer is included.

Serial No.	Name of sub-head.	6-6-37 to 28-3-38	1938-39.	1939-40.	1940-41.	1941-42.	1-4-42 to 5-6-42.	Total.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Pay of officer ..	18,519	26,292	27,732	29,172	30,612	8,234	1,40,561
2	Pay of establishment.	16,854	23,636	24,134	25,070	25,648	6,826	1,22,348
3	Leave salary ..	1,650	2,200	2,200	2,200	2,200	491	10,941*
4	Travelling Allowance.	2,995	3,900	3,900	3,900	3,900	905	19,500
5	Contingencies ..	19,640	26,155	26,155	26,155	26,155	6,515	1,30,775
	Total ..	59,658	82,183	84,301	86,497	88,515	22,971	4,24,125
6	Bombay Government contribution.	18,176	24,721	24,972	25,231	25,422	6,478	1,25,000

* Leave salary of P. A. O. is not included.

The receipts may amount to Rs. 21,000 to Rs. 25,000 for 5 years.

STATEMENT NO. II.

Abstract of budget estimates of the extension period for 3 years 1937—1940 wherein the Principal Agricultural Officer is included.

Serial No.	Name of sub-head.	6-6-37 to 28-3-38.	1938-39.	1939-40.	1-4-40 to 5-6-40.	Total.	Remarks.
		Rs.	Rs.	Rs.	Rs.	Rs.	
1	Pay of officer ..	18,519	26,292	27,732	7,475	80,018	
2	Pay of establishment.	16,854	23,636	24,314	6,826*	71,630	
3	Leave salary ..	1,650	2,200	2,200	491	6,541	(Leave salary of P. A. O. is not included.)
4	Travelling allowance.	2,995	3,900	3,900	905	11,700	
5	Contingencies ..	19,640	26,155	26,155	6,515	78,465	
	Total ..	59,658	82,183	84,301	22,212	2,48,354	
6	Bombay Government contribution.	18,176	24,721	24,972	6,478	74,347	The receipts may amount from 4,200 to 5,000 a year *i.e.*, for 3 years 12,600 to 15,000 rupees.

* There may be a reduction from about Rs. 300 to Rs. 400 in this figure as exact figures of increments to subordinate staff are not available here in Simla.

APPENDIX VII-F.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 12th June 1936, on Subject No. 8-C. (iii) :—Application from the Government of Bihar for a grant of Rs. 1,64,150 spread over five years for the continuation of the Sugarcane Research Scheme in Bihar.

Attention is invited to the attached note, dated the 12th June 1936, circulated to the Sugar Committee (Annexure). The recommendations of the Committee will be submitted to the Advisory Board in due course.

ANNEXURE.

NOTE BY THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, DATED THE 12TH JUNE 1936, ON SUBJECT NO. 23 OF THE AGENDA OF THE SUGAR COMMITTEE, JULY 1936 :—APPLICATION FROM THE GOVERNMENT OF BIHAR FOR A GRANT OF RS. 1,64,150 SPREAD OVER FIVE YEARS FOR THE CONTINUATION OF THE SUGARCANE RESEARCH SCHEME IN BIHAR.

Attention is invited to the attached extract from a letter from the Government of Bihar (Enclosure), forwarding proposals for the continuation of the Sugarcane Research Scheme in Bihar.

2. The scheme was originally sanctioned in 1930 at a total cost of Rs. 1,60,000 (Non-recurring Rs. 75,000 and recurring Rs. 85,000), and was started with effect from the 17th March 1932. Additional non-recurring expenditure of Rs. 3,459-12-0 was sanctioned in February 1933, and a further grant of Rs. 29,388 was approved by the Governing Body during the same year for a sub-station at Patna. The total grant for the scheme was accordingly raised to Rs. 1,92,847-12-0. In this connection, attention is invited to pages 5—6 and 38—45 of the printed proceedings of the fifth meeting of the Sugar Committee held in March 1933. In 1934, on account of the damages caused by the earthquake in Bihar, a special grant of Rs. 13,000 was made for the reclamation of land and installation of a new tube-well, and a sum of Rs. 20,000 was promised for the construction of quarters for the staff.

3. The total expenditure proposed for the 5 years of extension is Rs 1,64,150 (recurring), and after deducting the estimated receipts amounting to Rs. 15,000, the liability of the Council is reduced to Rs. 1,49,150. If the extension is approved it is intended that the research station should be transferred to Pusa where various facilities are available and it will not be necessary to avail of the Council's promise of making a grant of Rs. 20,000 for the building of quarters.

4. The proposed expenditure contains proposals for additional staff mentioned below —

		Total cost. Rs.
Botanical Assistant (Rs. 130—7—158)	..	8,640
Artist (Rs. 40—3—52) ..	..	2,760
Overseer (Rs. 40—3—52) ..	..	2,760
Total	..	14,160

An increase of Rs. 400 per annum under contingencies for the Patna Sub-Station has also been asked for, but no explanation is given for raising the provision under travelling allowance from Rs. 1,500 to Rs. 2,000 per annum during the last 3 years of the continuance, Provision under Farm Contingencies has been reduced from Rs. 10,000 to Rs. 5,000 a year.

5. In September 1935, the Governing Body considered the question of provincial contributions to continuation schemes of this kind and laid down the principle that "the province concerned should be asked to shoulder a part of the obligations when the utility of the scheme to the province was proved". In February 1936, the Advisory Board laid down 50 : 50 as the division of expenditure in the case of extensions of rice research schemes. The Bihar Government have indicated their inability to contribute 50 per cent of the cost of the scheme on account of financial stringency, and have objected to the principle on the ground that it would favour the richer at the expense of poorer provinces, irrespective of their agricultural importance.

ENCLOSURE.

EXTRACT FROM A LETTER FROM THE SECRETARY TO GOVERNMENT, EDUCATION AND DEVELOPMENT DEPARTMENT, BIHAR, RANCHI, TO THE SECRETARY TO THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, SIMLA, NO. 360-D.R., DATED THE 27TH MAY 1936.

SUBJECT :—*Extension of the Sugarcane Research scheme in Bihar.*

I am directed by the Government of Bihar (Ministry of Education) to submit for the consideration of your Council a proposal for the allotment of funds (Annexure to the enclosure) for the renewal of the Sugarcane Research Scheme in Bihar for a further period of five years. The scheme has at present been sanctioned by the Imperial Council of Agricultural Research for a period of five years which will end on the 17th March 1937. Research schemes of such importance cannot be expected to bear fruit in this short period and the Local Government agree with the Director of Agriculture, Bihar, that if they are not continued the money already spent on them by the Council will be wasted. This would be very unfortunate as the scheme has given hopes of good results in the future.

2. * * * As regards the sugarcane Research scheme the lands belonging to the main station at Mushari were badly damaged in the earthquake. A sum of Rs. 13,000 was sanctioned by the Imperial Council of Agricultural Research for sand clearance but difficulties continue to be experienced owing to the unevenness of the land. If the term of this scheme is further extended by the Imperial Council of Agricultural Research the Local Government propose to transfer the main station from Mushari to Pusa which is being acquired from the Government of India. Not only will the land at Pusa be more suitable for research work but buildings are also available for the accommodation of the staff for whom no quarters have yet been provided at Mushari. The necessary lands and buildings at Pusa will be provided by the Local Government and the Imperial Council will save a sum of Rs. 20,000 which was sanctioned in their letter No. F. 70|34-A., dated the 15th March 1935 (not printed). for the construction of quarters for the staff at Mushari. The Local Government will also continue to provide the land. cultivation and irrigation facilities for the sub-station at Patna.

3. At the meeting of the Governing Body of the Imperial Council of Agricultural Research held on the 2nd September 1935, it was suggested that provinces should be asked to contribute on a 50 : 50 basis towards the cost of a research scheme, the term of which was being extended. The representative of this Government could not attend the meeting as the local council was then in session. The Local Governmnet have not heard anything officially from the Imperial Council of Agricultural Research on this point and they assume that no final decision has yet been reached. They take this opportunity of stating their objections to the adoption of any such proposal which would favour the richer at the expense of the poorer provinces, irrespective of their agricultural importance. In Bihar financial stringency has been so acute that many schemes for agricultural development which were considered both urgent and necessary have had to be postponed indefinitely. If assistance from the Imperial Council of Agricultural Research is dependent on provincial contribution, research activities of an important character which are likely to be of value to other provinces besides Bihar will have to be curtailed before the full advantages of the work have accrued. In the circumstances, I am to express the hope that at least so far as these two important schemes are concerned, the question of a further contribution from the Local Government will not be pressed, and that the Imperial Council of Agricultural Research will take a broad view.

ANNEXURE TO THE ENCLOSURE.

Application for the extension of the Sugarcane Research Scheme in Bihar for a further term of five years from 18th March, 1937 onwards.

Introduction.

The sugarcane Research Scheme in Bihar and Orissa was sanctioned by the Imperial Council of Agricultural Research for a period of five years at a total cost of Rs. 1,60,000 and it started working in March 1932. The strength of the staff—Sugarcane specialist and an Overseer originally sanctioned, however, was soon found to be inadequate to deal effectively with the problems facing the sugar industry in those parts and a further sum of Rs. 29,388 was sanctioned during the second year to enable two graduate assistants to be added to the staff at the Main Station and a sub-station to be opened south of the river where conditions of cane growing were entirely different. This staff joined towards the end of the second year of the working of the scheme so that work for the first two years was considerably handicapped and more could have been accomplished if sufficient staff were provided at the very start. But the scheme had yet to suffer a terrible catastrophe in the Bihar earthquake of 1934, which crippled it in ways more than one. The continuity of experimental work was broken due to fissuring and heavy deposition of sand over the entire area. What was studied about the fertility and variation in blocks during the two years cropping was suddenly lost, leaving us land which even after reclamation had to be studied for at least two years before the results from scientific experiments conducted under the new soil conditions could be relied on. Reclamation of the land (thanks to the Imperial Council of Agricultural Research for readily providing a sum of Rs. 13,000 for the purpose) so badly damaged, involving curtailed experimental work, took away another year of promise. Further experience during the last year has shown the land to be very uneven still, so that experimental work on the agronomic side will be what can at best be managed with this type of land.

II.—The Industry's Position and Problems.

The rapid expansion of the sugar industry in response to the protection afforded has, on the other hand, made problems connected with the industry more pressing and urgent. Acreage under cane in the white sugar belt has considerably grown and the trend is yet towards the increase.

TABLE I.

Increase in area under sugarcane during the period of protection to date in North and South Bihar (where the expansion of the sugar industry has been most rapid).

Tracts.	Districts.	Approximate normal area before the protection.	Area in 1935 (2nd forecast).	Percentage increase.
North Bihar ..	Saran	59,500	67,800	13·9
	Champaran	21,100	86,700	310·9
	Muzaffarpur	22,000	50,000	127·3
	Darbhanga	21,100	57,400	172·0
	Monghyr	8,600	17,800	107·0
	Purnea	11,200	19,300	72·3
South Bihar ..	Patna	16,100	19,500	21·1
	Gaya	32,400	47,800	47·5
	Shahabad	42,900	45,100	5·0

Areas in close proximity of the new sugar factories are being put preferably under cane and efforts made to produce more tonnage per acre. To satisfactorily feed the mills hitherto neglected, areas are being brought under cane cultivation. Possibilities of utilizing even the 'Usar' and water-logged sections are being keenly enquired into by the Zirat Managers and the ryot. Improved varieties which will suit both the grower and the miller; varieties that will respond to intensive culture,; those that will suit special conditions of growth; and those that will extend the factory season by yet another fortnight on either side are in continual demand. To effect economies on the cultural side and to lower costs of production intensive study of 'sugar cane plant in relation to its environment' has necessarily to be undertaken. The problems of manurial, water and cultural requirements; of disease resistance and of maintenance of yield and quality by new varieties have all to be investigated whenever a new variety is introduced into the agricultural system of the tract. Again there are the specific problems of the nature of utilization of factory waste products like molasses and press mud cake, which the factories are extremely keen to make use of provided their beneficial effects could be demonstrated. Solitary attempts by individual growers and factory managers to press into service these products as manure for cane, without reference to their source, type of soil and season, have led to discouragement.

III.—*Need for continuous research.*

There is thus an obvious need for continuing research on the various items outlined above in a province which possesses over 10 per cent of its total area under cane in India ; which is responsible for 34 per cent of the white sugar manufactured in modern factories and for nearly 50 per cent. of the white sugar produced from cane ; where increase in acreage under cane and production has been phenomenal and far more than that of any other major sugarcane province (Table II), and where sugarcane cultivation forms an integral part of the economic fabric of the planters' community and the cultivator, who in North Bihar alone benefit to the extent of over Rupees 250 lakhs in cash every year.

TABLE II.

Showing increase in acreage and production during the protection period to date.—Final estimate of the Sugarcane crop of 1935-36 (Department of Commercial Intelligence and Statistics, India, No. 36).

Provinces and States.	Area (in acres).		Increase (+) or Decrease (—) in the current year over.	
	Current year 1935-36.	Average of preceding five years.	Previous year (1934-35).	Average of preceding five years.
			Per cent	Per cent
United Provinces (including Rampur State).	2,249,000	1,597,000	+2·22	+40·8
Punjab	473,000	446,000	+2·4	+6·1
Bihar and Orissa	465,000	313,000	+4·5	+48·6
Bengal	325,000	224,000	+17·8	+45·1
Madras	131,000	114,000	+7·4	+14·9
Bombay (including Sind and Indian States).	121,000	99,000	+6·1	+22·2
North-West Frontier Province ..	58,000	49,000	+34·9	+18·4
Assam	35,000	32,000	..	+9·4
Central Provinces and Berar ..	30,000	24,000	+3·4	+25·0
Delhi	3,000	4,000	—62·5	—25·0
Mysore	50,000	38,000	+8·7	31·6
Hyderabad	59,000	38,000	+15·7	55·3
Baroda	3,000	2,000	50·0	50·0
Bhopal (Central India)	5,000	(a)	25·0	..
Total ..	4,007,000	(b) 2,980,000	15·2	(b) 34·3

(*a*) Not available. (*b*) Excluding Bhopal.

Final estimate of the Sugarcane Crop of 1935-36—contd.

Provinces and States.	Yield (in tons) of Raw sugar (*Gur*).		Increase (+) or decrease (—) in the current year over.	
	Current year (1935-36).	Average of preceding five years.	Previous year (1934-35).	Average of preceding five years.
			Per cent	Per cent
United Provinces (including Rampur State).	33,36,000	2,063,000	+21·0	+61·7
Punjab	358,000	336,000	+9·8	+6·55
Bihar and Orissa	668,000	371,000	—0·7	+80·1
Bengal	560,000	330,000	+13·8	+69·7
Madras	360,000	322,000	+12·1	+11·8
Bombay (including Sind and Indian States).	313,000	256,000	+17·7	+22·3
North-West Frontier Province ..	63,000	55,000	+53·7	+14·5
Assam	35,000	33,000	+2·9	+6·1
Central Provinces and Berar ..	49,000	39,000	+4·3	+25·6
Delhi	3,000	2,000	—62·5	+50·0
Mysore	53,000	36,000	+23·3	+47·2
Hyderabad	99,000	60,000	+6·5	+65·0
Baroda	3,000	3,000	..	..
Bhopal (Central India)	5,000	(*a*)	-23·0	..
Total ..	5,905,000	(*b*) 3,906,000	15·6	(*b*) 51·0

(*a*) Not available. (*b*) Excluding Bhopal.

To see the industry well stabilized and in a position to compete with foreign sugar in her home markets when the protection is withdrawn, to be able to safely steer it through any difficulty it might experience, it is imperative that the continuance of research is ensured on a permanent basis with adequate staff to put in team work required for an industry of this magnitude.

IV.—Programme of work and results achieved.

Before proceeding further with the case for extension of the scheme it would be desirable to give a resumé of the work done and significance if any of the results to the sugar industry of the province. And since details of scientific work have appeared in the reports already submitted it will be

only necessary to put down the outstanding features. The primary object of the station was to test quickly and adequately seedling canes from Coimbatore with a view to select varieties ;

(*a*) better than Co. 213 in tonnage and sugar and suited to Bihar conditions ;

(*b*) early and late suitable for white sugar production so that the factory season may be extended ;

(*c*) to suit intensive cultivation ; and

(*d*) with special reference to disease resistance, rationing and special growth conditions such as 'Usar' water-logging and flooding.

The varietal position in 1932 when the scheme started working was as follows :—

Co. 214—An early cane, low yielder and bad habit ;

Co. 210—Suited to low rainfall, light land ; an early mid season cane ;

Co. 213—Suited to adequate rainfall, a heavy land main season cane.

Factory season extended to 120 days and recoveries towards the start and close were much lower than the peak mid season ones. Also the grower lost over 16 per cent of tonnage (chiefly as dryage losses) by keeping mid season varieties Co. 213 and Co. 210 standing in the field till April.

The present varietal position may be summarised as—

Co. 299—Is as early as Co. 214 but of higher yielding and desirable habit, is supplanting quickly Co. 214 in North Bihar.

Co. 313—a medium early cane likely to serve the mills from mid December to mid January (X'mas best) ; almost as high yielding as Co. 213 on good land.

Co. 213—mid season, mid January to early March.

Co. 313—Outstandingly heavy yielder—giving over 40 per cent more yield in tonnage and as much in sugar per acre, mid season in South Bihar and Chota Nagpur where likely to definitely supplant Co. 213 in course of times ; late maturing in North Bihar, likely to serve the mills best from end of February to end of April or early May.

With the getting into the agricultural system in North Bihar of these three varieties, *viz.*, Co. 299, Co. 313 and Co. 331 the supplies of desirable raw materials are likely to be ensured from about the middle of November to the beginning of May, thus extending the factory season by a month at the same time minimising tonnage losses to the ryots. Co.331 has demonstrated certain special features of interest, namely, that (*i*) it responds admirably to intensive culture, (*ii*) suited to low lying areas, (*iii*) is flood resistant, (*iv*) tolerates 'Usar' to a considerable extent and (*v*) has suited universally all conditions in the province. Co. 299 shows its best in heavy well-drained soil while Co. 313 prefers loam and light loam to heavy lands. There are other promising varieties ; Co. 370, Co. 371 in the early group,

Co. 373 and Co. 385 in the medium early group and Co. 386, Co. 421 and Co. 513 in mid-season group ; the two last named being outstandingly good and appear serious rivals to Co. 213, so that the varietal position promises to be very encouraging indeed.

Apart from the varietal work mentioned above, investigations for finding out the optimum conditions of growth of the newly selected varieties—best time for planting, distance apart in rows, soil, water, and manurial requirements, etc., have been conducted in detail. The results may be briefly summarised under various heads as below—

(*i*) *Germination studies*.—Germination in cane as influenced by (*a*) type and nature of soil, (*b*) amount and availability of soil moisture on which rests the depth of planting, (*c*) time of planting—earlier planting in the case of slow germinators and slow grower as also of early varieties, (*d*) type of planting material, fresh and healthy material obtained from the best stock to obtain high percentage of germination and subsequent growth ; soaking as a means to ensure quick germination, uniform stand and better yield and (*e*) application of oil cakes and artificials—indicates the desirability of avoiding application of castor cake in fields with low soil moisture content at planting times ; better germination if artificials are spread the evening prior to planting and mixed with soil next morning, before actual planting ; deeper plantings in " usar " soils have resulted in better germination than shallower plantings.

(*ii*) *Growth studies*.—These have been undertaken extensively with a view to discover critical phases of growth of the promising varieties to be able to demonstrate the periods when these varieties should receive most attention. Correlations have been worked out to serve as guide in future selection work.

(*iii*) *Cultural*.—Work on differential spacing in early and mid season varieties has shown 2½ ft., spacing between rows to be the best in the case of Co. 299 and 3 ft., in the case of both Co. 213 and Co. 313.

(*iv*) *Irrigational*.—Irrigation has been found to definitely and significantly increase cane yield per acre on light loam. The juice quality is significantly better later in the season in the case of irrigated crop. There is a suggestion also of the better utilization of artificials in the presence of irrigation.

(*v*) *Manurial*.—Manurial work has shown a combination of 40 lbs. N and 50 lbs. P_2O_5 (as worked out by the department) to be the optimum dose required for light lands in North Bihar. Higher doses have not resulted in increased yields except under the influence of irrigation in heavier soils. In South Bihar application of Nitrogen alone at 100 lbs., per acre has given the best results.

(*vi*) *Usar tolerance*—in descending order was found to be as follows :—

Highly tolerant Co. 326, Co. 205, Co. 285, Co. 318.

Tolerant—Co. 210, Co. 391, Co. 331, Co. 371, Co. 312, Co. 336, Co. 313.

Highly susceptible Co. 290, Co. 300, Co. 340, Co. 213, Co. 349, Co. 343, Co. 373, Co. 281, Co. 299, Co. 214, Co. 370.

Similarly varietal tolerance under submerged condition was in the order of Co. 285, Co. 331, Co. 326, Co. 213, Co. 281, Co. 210.

(*vii*) *Root work.*—Extensive studies have been undertaken to discover the types of root system—and their correlation with growth history and performance. One of the most important cultural operations in the successful growing of sugarcane in rain fed tracts of Bihar is the inter-cultivation of the crop after it is planted, and the study of root habits suggested this operation to be of greatest benefit during the dry weather when it stimulates deeper penetration of roots and fosters early development of tillers. Early in the rains inter-cultivation seems to encourage development of new roots—a factor of considerable importance in the utilization of manures added at the time of earthing.

(*viii*) *Miscellaneous.*—

1. *Seed question in early varieties*—Experiments conducted to find out the best method of preserving seed material in early varieties that mature about 2 months before the normal time for planting in Bihar, showed best results when material was left standing in the field and planted as soon after January as possible to avoid shooting due to rise in temperature.

2. *Burning trash in the field.*—A practice sometimes resorted to on account of inadequacy of labour in certain areas in North Bihar. It was found that though little damage was done to burnt stalks during the first 48 hours in cold months, the loss was very appreciable during spring when the practice should be discouraged. Similarly the topping of leaves for fodder purposes should only be resorted when the topped cane can be harvested and sent to the mill within 2 days otherwise deterioration sets in.

In addition ripening phases in different varieties have been studied. Simple technique for field sampling has been developed and comprises the use of hand refractometer and hypodermic syringe designed at the station. This is expected to prove of value to the cane superintendents incharge of mill supplies as also to the research workers. Similarly studies on deterioration on keeping have shown that such losses can be minimised by keeping the canes covered and moist.

It will thus be seen that a good deal of work of direct importance to the industry has been done although the scheme has not had the fortune or the facilities which similar other schemes are enjoying elsewhere.

The programme of work at the station has been recently revised and is attached. It is expected that by the end of the next term it will be possible to indicate ways and means of cheapening cost of production of cane crop by selecting and giving still higher yielding and better sucrose content varieties to the industry and demonstrating the optimum conditions under which they should be grown.

V.—*Financial aspect.*

The expenditure on the scheme for a further term of five years will be as shown below.—Experience during the last 5 years has shown that the staff provided for this research station is totally inadequate for the work. The non-existence of a Botanical Assistant and an Artist has hampered the work very considerably and provision has been made for this staff at the main station. Similarly one overseer is inadequate for the work and

one more is indispensably necessary. Salary of the new staff is according to the new scales of pay in force in Bihar. Otherwise the provision for staff and contingencies is the same as in the past five years except that there is a small increase of Rs. 400 per annum in the case of contingencies of the Patna sub-station. This increase is necessary to maintain trained labour throughout the year.

Details.	6th year from 18th March 1937.	7th year.	8th year.	9th year.	10th year.	Total.	Remarks.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
MAIN STATION.							
Sugarcane specialist (560—40—720).	6,720	7,200	7,680	8,160	8,640	38,400	Allowed Class I scale.
Physiological Assistant (180—7—208).	2,160	2,244	2,328	2,412	2,496	11,640	
Chemical Assistant (150—7—178).	1,800	1,884	1,968	2,052	2,136	9,840	
Clerk (60—2—68) ..	720	744	768	792	816	3,840	
Overseer (52—3—64)	624	660	696	732	768	3,480	
Fieldman (39—2—47)	468	492	516	540	564	2,580	
Sardar (23—1—27) ..	276	288	300	312	324	1,500	
Total, old staff ..	12,768	13,512	14,256	15,000	15,744	71,280	
NEW STAFF.							
Botanical Assistant (130—7—158).	1,560	1,644	1,728	1,812	1,896	8,640	
Artist (40—3—52) ..	480	516	552	588	624	2,760	
Overseer (40—3—52).	480	516	552	588	624	2,760	
Total new staff ..	2,520	2,676	2,832	2,988	3,144	14,160	
Total staff for Main Station.	15,288	16,188	17,088	17,988	18,888	85,440	
SUB-STATION.							
Botanical Assistant (180—7—208).	2,160	2,244	2,328	2,412	2,496	11,640	
Field Assistant (64—4—80).	768	816	864	912	960	4,320	
	2,928	3,060	3,192	3,324	3,456	15,360	
Total Staff ..	18,216	19,248	20,280	21,312	22,344	1,01,400	

Deatils.	6th year from 18th March 1937.	7th year.	8th year.	9th year.	10th year.	Total	Remarks.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
Travelling allowance ..	1,500	1,500	2,000	2,000	2,000	9,000	
Farm contingency ..	5,000	5,000	5,000	5,000	5,000	25,000	
Laboratory contingency	5,000	5,000	5,000	5,000	5,000	25,000	
Sub-station contingency	750	750	750	750	750	3,750	
Total ..	30,466	31,498	33,030	34,062	35,094	1,64,150	
Deduct—Probable receipts available for expenditure.	—3,000	—3,000	—3,000	—3,000	—3,000	—15,000	
Net expenditure ..	27,466	28,498	30,030	31,062	32,094	1,49,150	

D. R. SETHI,—4-4-1936,
Director of Agriculture, Bihar.

Revised programme of work for the Sugarcane Research Scheme in Bihar.

1. *Agronomical.*—

(*a*) Varietal :—

(*i*) *Nursery.*—Multiplication and preliminary study of varieties received from Coimbatore or bred at the station with a view to selecting early, mid season or late types for comparison with suitable standard varieties of their class in the observation plots.

(*ii*) *Observation plots I and II class.*—Detailed study for determining promising types and their suitability under different soil conditions met at the research station.

(*iii*) *Variety field trials.*—With the promising varieties in the early, medium early, mid season and late class. Similarly field trials to study suitability of different promising varieties for highland, lowland, " usarland ", as also for water-logged and flood conditions.

(*iv*) Mill trials of the successful varieties for getting them approved by the industry for general distribution.

The new varities will at the same time be tested as hitherto at the Sub-station at Patna and some of the other important central farms to demonstrate in as short a period as possible their suitability or otherwise under the diverse conditions obtained in the province.

(*b*) Manurial :—

Investigations into—

(*i*) The best combination of N and P in the case of new improved varieties in conjunction with (*i*) farm yard manure, (*ii*) green manure, (*iii*) without any organic manure.

(*ii*) Time of application of fertiliser.

(*iii*) Value of potassic manures in conjunction with the optimum combination of N. and P. particularly their effect on juice quality and disease resistance.

(*iv*) The interaction of manure with irrigation and varieties laid out in the form of complex trial. (The experiment has already been in force for one season and had been planted before the revised programme was received. It will therefore be studied for one more year and results submitted to decide if further work on this aspect should be undertaken at the station.)

(*v*) Manurial effects of molasses and press mud cake.—The experiment having already been laid out it will be carried through the season and results submitted.

(*c*) Irrigation experiments :—

To demonstrate the value of irrigation during stress periods.

(*d*) Cultural :—

(*i*) Time of planting.

(*ii*) Methods of planting such as trenching, flat, etc.

(ii) Spacing trials with the new successful varieties in the early, mid-season and late class as indicated by their root habits.

(*iii*) Study of differential spacing in relation to utilisation of manures in between the rows.

2. *Botanical and Physiological.*—

(*a*) Germination studies to find out causes for slow and poor germination in certain of the otherwise promising varieties and treatments to remedy the defect ; also economical treatments conducive to quick and uniform germination in canes ;

(*b*) Growth biometrics of varieties under observation in accordance with the note of the Imperial Sugarcane Expert.

(*c*) *Root studies.*—(*i*) Of the newly selected types under different soil conditions and at different farms in the province.

(*ii*) Of the promising varieties in the observation plots.

(*iii*) *In relation to different cultural and manurial practices.*

(*iv*) During critical periods to discover relationship between root activity in soil-layers having optimum moisture and the visible morphological condition and quantity of above-ground parts.

(*d*) *Water-logging, submergence, etc.*—Behaviour of different varieties under such conditions and characters correlated with tolerance, susceptibility or resistance.

(*e*) Water requirement studies with promising Coimbatore varieties *in situ* and in controlled drums with newly developed auto-irrigator device.

3. *Chemical.*—

(*a*) *Refractometer studies.*—These will be continued with a view to confirm (*i*) the regression equations worked for the past two seasons for calculating sucrose values from Brix in the field.

(*ii*) The sampling technique developed for the nursery, observation plots and field trials as well as for field ripening tests.

(*b*) Juice analysis of the various trials and varieties to discover the period over which they maintain juice quality without marked deterioration.

3. *Miscellaneous.*—(*i*) Minor investigation to answer certain of the queries coming forth from the estate managers and factories.

(*ii*) Correlation of sugarcane work in the province.

Sub-station.—

The varietal selection work will be carried on the same lines as at the main station. The other agronomic trials will be done in collaboration with the Deputy Director of Agriculture, Patna.

APPENDIX VII-G.

Supplementary note by the Secretary, Imperial Council of Agricultural ..Research, dated the 11th July 1936, on Subject No. 8-C. (iii) :— Application from the Government of Bihar for a grant of Rs. 1,49,150 spread over a period of five years for the extension of the Sugarcane Research Scheme in Bihar.

In continuation of the note dated the 12th June 1936 (Appendix VII-F), the attached extract from the proceedings of the Sugar Committee (Annexure I), together with the report of the sub-committee which examined the scheme (Annexure II), is circulated.

2. The scheme as revised will involve a grant from the Council of Rs. 84,446 spread over 3 years, as shown below :—

	Rs.	Rs.
Pay of establishment		56,196
Old staff	40,536	
New staff	6,480	
Sub-station	9,180	
Travelling allowance		5,000
Farm and Laboratory Contingencies ..		21,000
Sub-station contingencies		2,250
		84,446

N. C. MEHTA,
Secretary.

SIMLA,
The 11th July, 1936.

ANNEXURE I.

EXTRACT FROM THE PROCEEDINGS OF THE SUGAR COMMITTEE HELD ON JULY 9TH, 1936.

Application from the Government of Bihar for a grant of Rs. 1,64,150 spread over five years for the continuation of the sugarcane research scheme in Bihar, (Subject No. 23 of the agenda).

Dr. Shaw explained the Bihar scheme, and summarised the report of the sub-committee. As Mr. Sethi had explained, as a result of the various re-arrangements, an economy of Rs. 7,000 per annum would be effected. The total savings during a period of 5 years would be Rs. 17,760. Dr. Shaw said that the Committee considered that the appointment of the extra Botanical Assistant and the Artist might be allowed in the scheme. The

Committee also approved of a small increase of Rs. 400 in the contingencies of the Patna sub-station. The scheme was approved by the Committee subject to the criticisms above. It was stated that the Bihar Government was taking over a large portion of the Pusa Estate with the definite object of carrying on research work on cane, multiplying cane seed as quickly as possible, and pushing it on on a large scale. Mr. Sethi had explained to the Committee that on this work the Bihar Government was incurring an expenditure of Rs. 50,000, apart altogether from a capital expenditure amounting to about Rs. 3 lakhs, which they were meeting in taking over the Pusa Estate. The Committee considered that in recommending this scheme to the main Sugar Committee, they were justified in pleading for a generous interpretation of the 50 : 50 ratio of provincial to Central contributions. Dr. Shaw said that subject to the above recommendations, the Committee approved of the scheme.

Dr. Burns said that the Bombay and Bihar schemes were both renewal schemes and he had expected that they would be treated in the same manner. He congratulated Mr. Sethi on his scheme being unconditionally recommended while his was not. He only wanted these facts to be recorded for the information of the Committee.

Dr. Iyengar enquired what was the special reason for recommending the Bihar scheme for a period of 5 years instead of 3 years which was the principle followed in the case of the Bombay scheme.

The Chairman as well as Dr. Shaw were also in favour of Dr. Iyengar's suggestion. The Chairman pointed out the financial implications of extending the scheme for 3 years. The Council's contribution was to be roughly Rs. 86,000 for a period of 3 years.

Lala Hari Raj Swarup dissented from Dr. Burn's opinion and said that while the benefits of the Bombay scheme went to very small number of people—the few capitalists, those of Bihar scheme went to a large number of cultivators ; also that Bombay had a very small area under cane as compared with Bihar. Bihar had besides suffered greatly from the earthquake, and the Council should consequently deal generously with the scheme in the special circumstances as those of Bihar. He recommended the extension of the scheme for a period of 3 years.

Lala Shri Ram pointed out that the 50 : 50 contribution was a matter of principle rather than a matter of application specifically to the Bombay scheme.

Mr. Walchand Hirachand pointed out that out of a total of 75,000 acres of cane in Bombay the capitalists' share was only 10,000 acres.

Mr. Sherwani pointed that the United Provinces and Bihar were the two main cane-growing provinces, and consequently ought to be dealt with with special generosity. He pleaded for the continuation of the scheme for a period of 5 years.

The Chairman pointed out that out of a total of Rs. 86,000, the Council would contribute only about Rs. 33,000, as savings and the sale of land would cover about Rs. 53,000.

It was decided to recommend the scheme for a period of 3 years only by a majority. The scheme was accepted unanimously and was recommended by the Committee for a period of 3 years.

ANNEXURE II.

REPORT OF THE PROGRESS REPORT SUB-COMMITTEE HELD AT ROCK HOUSE AT 2-30 P.M., ON 8TH JULY 1936.

* * * * * * *

Application from the Government of Bihar for a grant of Rs. 1,64,150 spread over five years for the continuation of the sugarcane research scheme in Bihar. (Item 23 of the agenda).

Mr. D. R. Sethi explained to the Sub-Committee that the Bihar Government propose to shift the sugarcane research station from Mushari to Pusa. At Pusa every year they propose to have 150 acres under cane and the necessary area that is required by the Sugarcane Specialist for his work would be placed at his disposal. All expenditure on account of cost of cultivation of this area would be incurred by the Local Government and any receipts would go to the local Government. The savings to the Council annually would amount to Rs. 3,000 under this head, as instead of Rs. 10,000 for farm and laboratory contingencies only Rs. 7,000 would be required. On account of this saving, the Overseer asked for in the scheme, would not be required from the Council. The total saving in recurring expenditure during the 5 years would amount to Rs. 2,760 on account of the overseer and Rs. 15,000 from farm contingencies. Other savings to the Council would amount to Rs. 20,000 as this sum had already been promised to Bihar for buildings. Another saving to the Imperial Council of Agricultural Research was that lands and buildings at Mushari, which are the property of the Imperial Council of Agricultural Research would no longer be required. The land was acquired for Rs. 39,000 ; it was for the Council to dispose of that land. The total savings to the Council would amount to Rs. 67,760.

It was evident to the Sub-Committee, therefore, that on the recurring items in the scheme, the proposal of Mr. D. R. Sethi made a saving of Rs. 17,760 against which the provision of an Assistant and an Artist came to Rs. 11,400.

The Committee, in view of Mr. Sethi's explanation agreed to the additional staff, namely, one Botanical Assistant and one Artist proposed in the scheme. The Overseer, they noted, was not required.

Mr. Sethi explaned that the reason for the increasing of travelling allowance was due to the normal increase in Mr. Khanna's pay which placed him in a different scale.

The Committee approved of the increase in Rs. 400 in contingencies at the Patna sub-station. The Committee note that the revised programme of work is the same as that contained in the annual report considered by them above, and approve of the programme subject to the modifications suggested in that case.

The Sub-Committee noted that the Bihar Government were taking over Pusa with the definite object of carrying on the work of this research scheme, multiplying seed as quickly as possible and pushing it on on a much larger scale and that this was going to cost the budget of Bihar Department of Agriculture a sum of Rs. 50,000 annually.

The Committee consider that in view of the expense to which the Local Government are going in taking over the Pusa estate for sugarcane work, they would recommend a generous interpretation of the 50 : 50 basis laid down by the Council.

APPENDIX VIII.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 19th May 1936, on Subject No. 8-D (i) :—Application from the Nizam's Government for Rs. 31,535 spread over five years for a Scheme of Sugarcane Research in the Hyderabad State.

Attention is invited to the attached copy of a note, dated the 19th May 1936, circulated to the Sugar Committee (Annexure). The recommendations of the Committee will be submitted to the Board in due course.

ANNEXURE.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 19th May 1936, on Subject No. 14 of the Agenda of the Sugar Committee, July 1936 :—Application from the Nizam's Government for Rs. 31,535, spread over five years, for a Scheme of Sugarcane Research in the Hyderabad State.

Attention is invited to the attached copy of a Scheme (Enclosure) for Sugarcane Research in the Hyderabad State. The Scheme involves a total expenditure of Rs. 31,535, including Rs. 5,375 non-recurring, spread over a period of 5 years. The Nizam Government have been asked to furnish particulars of the size of the existing laboratory at Rudrur and its equipment including gas, water and electric supply, and also to bear the charges in respect of a typewriter, office furniture and the cost of building, temporary quarters for the office and staff. Their *reply on receipt, will also be placed before the Committee.*

ENCLOSURE.

Scheme for Sugarcane Research in the Hyderabad State.

Thanks to the Imperial Department of Agriculture, it has become possible to produce sugar from the coarse granite sand of the Deccan. The eastern half of the Hyderabad State and the adjoining districts of the Madras Presidency have a soil which is very loose in character. The local variety of sugarcane used to be grown on this area on a considerable scale, in the days when wood was plentiful and was obtainable free of cost. It is a variety of soft thick cane of the Pundiya type, which cannot stand without artificial wooden supports. Since wood became scarce, the area under sugarcane diminished gradually to a very small figure. It was a problem to revive the cultivation of sugarcane. The State has invested crores of rupees in construction of reservoirs and canals, from which abundant water has become available for irrigation. The success of these undertakings depended a great deal on extension in the cultivation of sugarcane. The local department of Agriculture had to solve the problem, both in the interest of the country and in the interest of the Government.

2. The Agricultural Department found that a change was necessary, both in the methods of cultivation and in the variety of sugarcane. After making trials on the departmental farms, the department hit upon

the No. 213 variety of the Imperial Sugarcane Breeding Station, Coimbatore, and started introducing the same in the year 1929-30. Before that, no cultivator in that part of the country knew that there existed any variety of cane which could stand without props. The effort has been wonderfully successful. There is in the present season of 1934-35 an area of about 14,000 acres under Co. 213 in the State. Of this about 10,000 acres are under the Nizamsagar canal alone. Coimbatore No. 213 has almost totally replaced the local variety, which covers about 500 acres only in that area. The State used to import *gur* amounting to about 24,000 tons annually. This year it is expected that it will have some surplus to export. It is proposed to establish a sugar factory now. The State is thankful to the Imperial Council of Agricultural Research, for deputing their Sugar Technologist to Hyderabad to advise us in the matter. Mr. R. C. Srivastava, after touring in the Nizamsagar canal area and studying the conditions himself, has submitted a very comprehensive report, which is a valuable guide to all intending sugarcane growers and sugar manufacturers. We are making full use of the same, and it is expected that the proposed factory will work in the 1936-37 season.

3. We were aware of the fact that Co. 213 was not the last word in cane, and that the Coimbatore Sugarcane Breeding Station was a mine of sweet gold. While introducing Co. 213 in general cultivation, the Agricultural Department has been carrying out experiments with some other important varieties, a few of which have been giving promising results. But, to place our research work on systematic lines, we considered it advisable to consult the originator of the Coimbatore canes. Thanks are due to the Imperial Department of Agriculture, who, at our request, deputed the Imperial Sugarcane Expert to Hyderabad last year to advise us. Rao Bahadur T. S. Venkatraman, after touring in the Nizamsagar area and studying the conditions on our farms, has submitted a report, which is of very great value, both from the point of view of extension in the cultivation of sugarcane and manufacture of sugar. He has also given us setts of a large number of varieties for trial, so that we have a series of about 50 varieties under observation on our farms now.

4. In his report, Rao Bahadur Venkatraman has said that the problems for the future will be somewhat on the following lines :—

(1) To discover types of cane and introduce methods of cultivation for cheapening cost of raw material.

(2) To discover canes both earlier and later than extant kinds, with the object of extending the cane crushing season.

(3) To discover cane types that would grow on Regur and other supposed unsuitable soil types, and in regions where perennial irrigation is not available.

(4) To improve the soils both in plant food and moisture retentiveness.

He has included, in his report, detailed instructions as to how these problems are to be tackled, the most important of which is the trial and selection of varieties. This, as he has rightly indicated, necessitates

careful and detailed studies, agricultural, botanical and chemical. It is obvious that the ordinary farm staff cannot carry out this work satisfactorily. A wholetime staff is essential for the purpose. It is this staff that we request the Imperial Council of Agricultural Research to provide. The work will be done at the Government Experimental Farm at Rudrur, in the Nizamabad district. This farm possesses the desired conditions for the work, and is situated in the centre of the Nizamsagar canal area. Nothing is asked for, for the equipment of the farm or for running the same. The sugarcane crop required for the research will be grown at the expense of the farm. The budget estimates are as follows, and its details are explained below.

5. The amount required for non-recurring expenditure is Rs. 5,375, and for the recurring expenditure Rs. 26,160 spread over 5 years, which works out to an average of Rs. 5,232 per year. The total amount required for 5 years is Rs. 31,535.

6. Of the non-recurring amount of Rs. 5,375, Rs. 3,100 are required for temporary *kutcha* buildings for an office room and for quarters for the assistant, fieldman, kamgar and clerk. These buildings are an unavoidable necessity, because Rudrur is a small village, where houses cannot be had. There is an equipped chemical laboratory at the farm which will be made available for the use of the scheme. The peon belonging to the scheme will be accommodated in one of the Menials' quarters of the farm. The apparatus, etc., which the laboratory has at present, and which belongs to the Chemical section of the department, will remain there for the use of the scheme. An amount of Rs. 2,275 is required for the additional equipment needed for the work.

7. Under the recurring expenditure, provision is asked for, for one qualified assistant, one fieldman and one kamgar, for technical work. A clerk is necessary for the writing and copying work in connection with the scheme. Provision of Rs. 600 annually has been made for travelling allowance. This includes the expenditure which will be incurred in deputing the assistant to Coimbatore for training and his visiting one or two sugar factories, before starting the work. An amount of Rs. 300 is asked for, for replacement of apparatus, chemicals, etc. The provision of Rs. 500 under "Contingencies" is meant for maintenance of buildings, occasional labour which will be required by the assistant for root studies, etc., etc., The peon and his livery need no explanation

8. This research is expected to give very useful results, for instance, the varieties which will be suitable for the large area of the loose soil of the Deccan, for the soils which are supposed to be unsuitable for sugarcane and for the areas where perennial irrigation is not available. It will be a valuable link to the chain of sugarcane research stations which the Council has established all over India.

NIZAM-UD-DIN HYDER,

Director of Agriculture,

H. E. H. the Nizam's Dominions.

I. Estimates of Non-Recurring Expenditure.

A. *Temporary kutcha buildings* :—

	Rs.
1. Office room	500
2. Quarters for one assistant	1,500
3. Quarters for a fieldman	500
4. Quarters for a kamgar	300
5. Quarters for a clerk	300

B. *Additional Technical Equipment* :—

	Rs.
1. Saccharometer	850
2. Accessories	150
3. Photographic camera	500
4. Office equipment and furniture	500
5. Typewriter	275
	5,375

II. Estimates of Recurring Expenditure.

———	I Year.	II Year.	III Year.	IV Year.	V Year.	Total amount.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
a.—Salaries.						
1. One Agricultural Assistant at Rs. 150—10—190 *p. m.*	1,800	1,920	2,040	2,160	2,280	10,200
2. One fieldman at Rs. 60—4—76 .. *p. m.*	720	768	816	864	912	4,080
3. One kamgar at Rs. 30—2—38 *p. m.*	360	384	408	432	456	2,040
4. One clerk at Rs. 30—2—38 *p. m.*	360	384	408	432	456	2,040
5. One peon at Rs. 12 *p. m.* ..	144	144	144	144	144	720
Total salaries ..	3,384	3,600	3,816	4,032	4,248	19,080
b. Travelling allowance	600	600	600	600	600	3,000
c. Peon's livery	25	10	10	25	10	80
d. Technical equipment	300	300	300	300	300	1,500
e. Contingencies (maintenance of building, occasional labour, etc.)	500	500	500	500	500	2,500
Grand total ..	**4,809**	**5.010**	**5,226**	**5,457**	**5,658**	**26,160**

APPENDIX VIII-A.

Supplementary note by the Secretary, Imperial Council of Agricultural Research, dated the 7th July 1936, on Subject No. 8-D (i) :—Application from the Nizam's Government for Rs. 31,535 spread over five years, for a Scheme of Sugarcane Research in the Hyderabad State.

In continuation of the note, dated the 19th May 1936 (Appendix VIII), the attached note, dated the 7th July 1936 for the Sugar Committee (Annexure), is circulated to the Advisory Board.

ANNEXURE.

SUPPLEMENTARY NOTE BY THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, DATED THE 7TH JULY 1936, ON SUBJECT NO. 14 OF THE AGENDA OF THE SUGAR COMMITTEE, JULY 1936 :—APPLICATION FROM THE NIZAM'S GOVERNMENT FOR RS. 31,535 SPREAD OVER FIVE YEARS, FOR A SCHEME OF SUGARCANE RESEARCH IN THE HYDERABAD STATE.

In continuation of the note, dated the 19th May 1936 (Appendix VIII), the attached letter from the Nizam's Government (Enclosure) is circulated to the Sugar Committee.

ENCLOSURE.

COPY OF A LETTER NO. 5865, DATED THE 26TH MAY 1936, FROM THE SECRETARY TO GOVERNMENT, DEPARTMENT OF COMMERCE AND INDUSTRY, H. E. H. THE NIZAM'S GOVERNMENT, HYDERABAD, DECCAN, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, SIMLA.

SUBJECT :—*Scheme for Sugar Research in Hyderabad.*

With reference to your letter No. F. 18|36-A., dated the 1st February 1936, I am directed to forward herewith a copy of the Director of Agriculture's letter No. 9384, dated the 6th May 1936, together with a copy of its enclosure containing replies to the points raised in your letter under reference.

As regards paragraph 3 of the Director of Agriculture's abovementioned letter, I am to add that we do not, however, wish to press for anything contrary to the principles governing similar grants.

Copy of a letter No. 9384, dated the 1st Teer 1345 Fasli (6th May 1936), from the Director of Agriculture, addressed to the Secretary to Government, Department of Commerce and Industries, H. E. H. the Nizam's Government, Hyderabad (Deccan).

SUBJECT :—*Hyderabad Sugarcane Research Scheme.*

I have the honour to acknowledge the receipt of your letter No. 3321, dated the 14th Farwardi 1345 Fasli and subsequent reminder and to submit as follows with reference to letter No. F. 18|36|A., dated 1st February 1936, of the Secretary to Imperial Council of Agricultural Research, a copy of which was received with the same.

2. The size of the chemical laboratory at the Rudrur Farm is 19′ 9″ × 19′ 9″, with a verandah 19′ 9″ long and 8′ wide. The room is equiped with the usual laboratory furniture, *i.e.*, working tables, sink, etc. There are no arrangements for electric supply and gas. Water is supplied through pipe connection from a reservoir which is filled from a well. A list of the apparatus, etc., with which the laboratory is provided is enclosed herewith.

3. As to the principle of the Imperial Council of Agricultural Research that they do not grant funds for temporary buildings, furniture and type-writer, I beg to say that we have already offered to place our chemical laboratory at the disposal of Imperial Council of Agricultural Research and have also offered to provide quarters for the peon of the scheme. The Council has sanctioned grants for buildings, furniture, etc., in many cases, for instance, some of the Sugarcane Research Schemes, and Dry Farming Research Schemes. I hope that considering that they have granted large amounts for staff and equipment for sugarcane research in a number of provinces, they will agree to sanction in full the grant applied for by us, because we are asking for a much smaller amount and have offered to provide much more proportionately.

List of the laboratory equipment at Rudrur.

Serial No.	Description of apparatus.	Quantity.
1	Desicator 8-3-4″ dia.	1
2	Desicator 6″ dia.	1
3	Pipettes 10 cc.	2
4	Pipette 15 cc.	1
5	Pipette 50 cc.	1
6	Pipette 100 cc.	1
7	Pipettes 20 cc.	2
8	Pipettes 25 cc.	2
9	Pipettes 5 cc.	2
10	Pipette 1 cc.	1
11	Glass Tubing and rods	4 lbs.
12	Filter stands for two funnels	4
13	Burette stand single	1
14	Test tube basket	1
15	Washing brushes, assorted	12
16	Volumetric flask, 1000 cc.	1
17	Volumetric flasks, 500 cc.	2
18	Volumetric flasks, 250 cc.	5
19	Volumetric flask, 100 cc.	1
20	Watch glasses, 4″ dia.	12
21	Watch glasses, 6″ dia.	4

Serial No.	Description of apparatus.	Quantity.
22	Wash bottles, complete	3
23	Weighing bottles	3
24	Glass cutting knife	1
25	Horn spatula, 8″	1
26	Spatula, 4″	1
27	Weighing Alluminium basin, with counterpoise	1
28	Wax pencils	6
29	Sugar flasks, 50—55	6
30	Sugar Flasks, 100—110	2
31	Sugar flasks, 200—220	2
32	Butcher funnels, dia. 9·5 cc.	3
33	Funnels, dia. 7 cm.	3
34	Funnels, dia. 7½ cm.	1
35	Funnels, dia. 14 cm.	2
36	Funnels, dia. 11½ cm.	2
37	Funnels, dia. 5—7 cm.	12
38	Porcelain dishes, dia. 4″	6
39	Porcelain dishes, dia 5½	3
40	Porcelain dishes, dia. 6	12
41	Porcelain Spot plate 12 cavities	1
42	Silica crucibles	6
43	Stemless funnels, Dia. 11½″ c.c.	2
44	Graduated cylinder, 250 c.c.	1
45	Graduated cylinders, 100 c.c.	2
46	Graduated cylinders, 50 c.c.	2
47	Graduated cylinder, 25 c.c.	1
48	Graduated cylinder, 10 c.c.	1
49	Graduated cylinder, 500 c.c.	1
50	Graduated cylinder, 1,000 c.c.	1
51	Graduated stoppered cylinder, 250 c.c.	1
52	Graduated stoppered cylinders, 100 c.c.	2
53	Graduated stoppered cylinders, 50 c.c.	2
54	Graduated stoppered cylinder, 250 c.c.	1
55	Stoppered N. M. bottles, 400 c.c.	12
56	Stoppered N. M. bottles, 600 c.c.	2
57	Stoppered N. M. bottles, 750 c.c.	2
58	Rubber tubing	10 yds.
59	W. M. bottles, 400 c.c.	3

Serial No.	Description of apparatus.	Quantity.
60	W. M. bottles, 100 cc.	6
61	Iron stands with 10 rings	3
62	Strokes patten still	1
63	Nickel plated weights	1 set.
64	Tongs N. P.	2
65	Mohr's clips	6
66	Screw clips	6
67	Spirit lamp	1
68	Wire guazes	6
69	Wire guazes, with asbestos centre	6
70	Clay pipe triangles	3
71	Clamp iron for burette	1
72	Kjeldhal flasks	4
73	Test tubes, rimless	24
74	Test tubes, with rims	24
75	Large test tubes	12
76	Flasks, flat bottom 500 c.c.	6
77	Flasks, flat bottom 250 c.c.	4
78	Flasks, flat bottom 100 c.c.	4
79	Erlynmeyer flasks, 100 c.c.	6
80	Erlynmeyer flasks, 250 c.c.	24
81	Calipper with vernier	1
82	Roverberolrough weighing balance	1
83	Tripod stands	2
84	Burettes, glass	3
85	Burettes, glass for alkali	2
86	Watch glasses, Dia. 5 cm.	6
87	Beakers, 500 c.c.	6
88	Beakers, 250 c.c.	13
89	Beakers, 800 c.c.	2
90	Beakers 1,000 c.c.	1
91	Test-tube holders	5
92	Two litre bottles	5
93	Water bath	1
94	Hot air oven	1
95	Hoss lamps (Wick burners)	2
96	Primus stoves	3
97	Sidget stove	1

Serial No.	Description of apparatus.	Quantity.
98	Hydrometers	2
99	Brix hydrometers	2
100	Stand for basin	1
101	Basin for washing	1
102	G. I. Water tank	1
103	Enamelled bucket with cover	1
104	Sink	1
105	Single way water tap	1
106	Rubber stoppers	29
107	Corks, assorted all sizes	67 each.
108	Platinum wire 3″, attached to glass rod	1
109	China dish, Dia. 27 cm.	1
110	Small G. I. buckets	4
111	Wide mouth sample bottle	1
112	Iron clamps	2
113	Measuring tape, 25 ft.	1
114	Water tap with tapering nozzle	1
115	Lead pipe, inner Dia. 3″	4 feet.
116	Cork screw	1
117	Cla jar with tap	1
118	Insulating mats	12
119	Asbestos sheets, 5″ × 5″	2
120	Absestos sheet 3″ × 3″	1
121	Large size almirah for storing glass ware and chemicals	1
122	Twenty litre bottles, for distilled water	1
123	Work Tables, (supplied by P. W. D.)	3
124	Stool	1

(Sd.) P. J. KRISHNA,
Agricultural Chemist,
H. E. H. the Nizam's Government.

APPENDIX VIII-B.

Supplementary note by the Secretary, Imperial Council of Agricultural Research, dated the 11th July 1936, on Subject No. 8-D (i) :—Application from the Nizam's Government for a grant of Rs. 31,535 spread over five years for a Scheme of Sugarcane Research in the Hyderabad State.

In continuation of the Supplementary note, dated the 7th July 1936 (Appendix VIII-A), the attached extracts from the proceedings of the Sugar Committee (Annexure I), and of the report of the sub-committee which examined the scheme (Annexure II), are circulated for consideration.

2. The Committee has recommended that the scheme be dropped.

ANNEXURE I.

EXTRACT FROM THE PROCEEDINGS OF THE SUGAR COMMITTEE MEETING HELD ON JULY 9TH, 1936.

In introducing the subject, Dr. Shaw explained that the sub-committee considered this scheme from the technical and agricultural point of view. From the agricultural point of view the scheme was approved. While the sub-committee was sitting, a telegram was received to the effect that the Hyderabad Government were prepared to meet the non-recurring items of cost of buildings, office equipment, typewriter and furniture amounting to Rs. 3,875 which meant reduction of this sum from the total amount of the scheme. He pointed out that if the scheme was approved by the Committee, it would be sometime before the funds would be allotted and the Hyderabad Government would have ample time to depute a man for training to Coimbatore and the Botanical Section of the Imperial Institute of Agricultural Research before starting the scheme. Subject to these modifications proposed by the sub-committee the report was recommended for adoption leaving the full Committee to decide whether a grant for sugarcane research for the Hyderabad State was justified or not.

Mr. Srivastava said that the idea of having a laboratory on the farm was his suggestion. The Hyderabad Department had no equipment at all there. He suggested the establishment of proper laboratory for determining the sugar-content of cane. He suggested that the amount for equipment should be fixed after the H. E. H. Government had submitted a list of their equipment which is available there.

Mr. Sherwani was surprised at the plea of economy in purchasing a proper saccharimeter for this particular scheme, when the Committee had already sanctioned a similar scheme for Baroda. He recommended the approval of the scheme.

The Chairman said that the question was whether any grant and, if so, what should be given to Hyderabad for the programme of work proposed.

Rao Bahadur Venkatraman agreed with Mr. Srivastava that an accurate saccharimeter was absolutely essential for the work of the research station.

Mr. Nizam-ud-din Hyder said that the area under cane in the whole of the Hyderabad State was 60,000 acres including 20,000 acres near the farm.

The Chairman said that this was undoubtedly a scheme which he would recommend the Hyderabad Government itself to undertake but felt doubtful whether the Council should finance it.

Mr. Nizam-ud-Din Hyder said that Rao Bahadur Venkatraman's advice had been sought as regards the growing of cane in the State especially in connection with the starting of the sugar factory ; that a farm had already been started and that research was now needed which should be financed by the Imperial Council of Agricultural Research.

The Chairman enquired whether there was any possibility of getting results of all-India importance, whether the scheme had an all-India aspect and whether it was necessary to add another station to the existing chain of stations.

Mr. Nizam-ud-Din Hyder said that the area on which the sugarcane was proposed to be grown was a granite, sandy area of loose soil. He thought that the results of this experiment would be available for the rest of the country having similar kinds of soil.

Rao Bahadur Venkatraman considered the scheme for Hyderabad as important as the one recently sanctioned for Baroda. The question whether further spread of sugarcane cultivation should be encouraged was however altogether a different question. The work proposed to be done was likely to be useful for similar tracts in the neighbouring province of Madras.

Sir Sundar Singh Majithia enquired whether experience of these different tracts regarding cane cultivation was not already available ? He thought that when the State was launching a big factory scheme, it was but proper that it should also finance a scheme of this nature. He did not favour the establishment of further cane stations and recommended that the State should take advantage of the results already obtained elsewhere.

Mr. Richards raised the question whether it was desirable to increase the area under cane which he touched upon earlier at the meeting of the sub-committee. He said that the scheme should be tentatively passed subject to the proviso that in case it was considered undesirable to increase the area of cane, the scheme should be dropped.

The Chairman enquired whether such a proposal was practicable. He doubted whether it was advisable to finance the scheme. The scheme dealt with only a small area and it was not possible to multiply indefinitely the number of existing stations. He also pointed out that Mysore was dealing with the breeding of thick canes which was a matter of importance for the whole of India, just as Hyderabad was dealing with the question of castor breeding on an all-India basis.

Dr. Burns said that Bombay had withdrawn a groundnut scheme for similar reason. It was then unanimously decided to drop the scheme as being more suitable for finance by the Hyderabad State itself.

ANNEXURE II.

REPORT OF THE PROGRESS REPORTS SUB-COMMITTEE HELD AT ROCK HOUSE AT 2-30 P.M. ON 8TH JULY 1936.

*   *   *   *   *   *   *

Application from the Government of His Exalted Highness the Nizam of Hyderabad for Rs. 31,535 spread over 5 years for a scheme of sugarcane research in Hyderabad (item 14 of the agenda).

The Committee considered the object of the scheme and from the agricultural point of view approved them. In considering the estimates of non-recuring expenditure, the Committee note that the Hyderabad Government will bear the cost of buildings, office equipment and typewriter and furniture amounting to Rs. 3,875.

(*b*) *Additional technical equipment.*—The Committee recommend a lump sum grant of Rs. 1,500 for the purchase of the saccharometer, etc.

Recurring expenditure—

Agricultural Assistant.—The Committee agree to the scale of pay proposed subject to the condition that the man appointed be sent for training at the Sugarcane Breeding Station at Coimbatore and the Botanical Section, Pusa. The Committee approved of the fieldman and kamgar at the scale of pay proposed. But in view of the fact that the farm in existence has an administrative staff, they do not consider that a clerk is required in the scheme. For the same reason, the Committee consider that a peon is not necessary in the scheme and item (*c*)—Peon's livery—may be deleted from the scheme.

Item (*e*)—contingencies—should be reduced from Rs. 500 to Rs. 400 as the maintenance of buildings will not fall on the scheme. Subject to these modifications, the scheme is approved by the Committee.

APPENDIX IX.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 18th June 1936, on Subject No. 9 :—Progress Reports on Veterinary Research Schemes sanctioned by the Imperial Council of Agricultural Research.

The progress reports noted below will be considered by an *ad hoc* Committee and its report (Appendix X) will be circulated to the Advisory Board in the usual course :—

(1) Annual reports for 1935-36 on the work of the Veterinary Investigation Officers in the Provinces (except the North-West Frontier Province) and Hyderabad State.

(2) Annual report for 1935-36 on Johne's disease investigation scheme in Mysore.

(3) Annual report for 1935-36 on the Central Provinces Goats Virus Vaccination Scheme.

(4) Annual report for 1934-35 on the Punjab Parasitological Scheme.

(5) Annual report for 1935-36 (fifth year) on Mr. Slater's scheme for the improvement of goats in the United Provinces.

APPENDIX X.

Proceedings of the meeting of the Veterinary Progress Reports Committee appointed by the Imperial Council of Agricultural Research *held at Simla on the 13th and 14th July 1936.*

The following were present :—

1. Colonel A. OLVER (*Chairman*).
2. Mr. B. K. BADAMI.
3. Mr. N. CHATTERJI.
4. Mr. T. J. EGAN.
5. Mr. E. S. FARBROTHER.
6. Mr. J. S. GAREWAL.
7. Rai Sahib S. GHOSH.
8. Mr. P. J. KERR.
9. Mr. R. N. NAIK.
10. Mr. T. F. QUIRKE.
11. Major P. B. RILEY.
12. Mr. P. T. SAUNDERS.
13. Mr. S. M. A. SHAH.
14. Mr. F. WARE.
15. Mr. V. L. WAZIR.
16. Captain A. C. AGGARWALA (*Secretary*).

13th July—3 P.M. to 6-15 P.M. (Legislative Assembly Building).

The Annual Reports of the Veterinary Investigation Officers in the Provinces (except North-West Frontier Province) and Hyderabad State for the year 1935-36 were discussed province by province.

Madras Report.

The observations made in connection with " Strike in Sheep " were discussed and it was suggested that these should be published separately, but it was agreed after discussion that the classification of Anaerobes was a very difficult matter and that more work would be needed to justify publication. It was however evident that diseases of this class were of great economic importance and Director, Muktesar, stated that though a little work on the anaerobes had been done at Muktesar they had never been in a position to deal satisfactorily with that class of organisms ; and it was agreed that a specialist officer should be employed to make a special study of the anaerobes of live-stock in India. As these conditions were particularly prevalent in Madras it was agreed that Director of Veterinary Services, Madras, should put up a scheme for the appointment of a competent research worker for 5 years to carry out systematic research on the anaerobes. A well qualified officer should be selected in this country and sent to England for a year's special training and it was agreed that he

should have at least a B.Sc. degree in addition to full veterinary qualifications and on his return he should be stationed at Madras where it was understood that all necessary facilities could be provided.

In regard to contagious pleuro-pneumonia of sheep it was suggested that the Veterinary Investigation Officer, Madras, should get in touch with Muktesar in order that vaccination with lymph obtained from affected animals might be tried, as this method of control had proved efficacious in a similar condition in other countries. It was noted that the infection of human beings with anthrax which was mentioned in the previous report had been confirmed and it was agreed that the Disease Investigation Officer had done useful work.

Bombay Report.

In regard to "Horn Mange of Buffaloes" it was agreed that "n. sp." in line 4, paragraph 48 should be deleted. Later, the discussion centred on two points in connection with use of Goat Tissue and Blood Virus for the control of Rinderpest. After discussion the President took the sense of the meeting on the following points, *viz.*, (1) If there was any material difference in reaction to goat virus in buffaloes and cattle. (2) If there was any difference in the reaction between Tissue and Blood Virus. As regards (1) it was agreed that the reaction in buffaloes was usually more severe and that it was necessary to exercise care when inoculating valuable animals as a prophylactic measure. The vaccine had however been extensively used for the control of outbreaks with very satisfactory results. As regards (2) the consensus of opinion was that the reaction to Tissue Virus was definitely milder while the immunity conferred had been proved to be a lasting one, in both cases. It transpired that the immunity conferred by goat vaccine had now been proved in more than one province to be solid up to 3 years, which was the longest interval after inocculation at which it had so far been possible to carry out tests. It was considered that this report was somewhat long and the Committee was of opinion that the annual Reports of Veterinary Investigation Officers should not usually exceed a maximum of 20 pages, including tables and appendices. Valuable work had however been done.

Bengal Report.

It was pointed out that much of the work done by the V. I. O., Bengal, had been in relation to Rinderpest because of the great importance of standardizing the tissue virus method of protection. *Inter alia* it had been shown that men of ordinary intelligence and ability could prepare this vaccine in the field. This had been necessary in dealing with a very fatal outbreak in a remote area and the disease had been brought under control without mishap. The observations on Calcutta Sore were of interest and it was agreed that more work was required on this condition. In future more detail should be given as to the programme of work to be completed or taken up.

U. P. Report.

Director, Imperial Institute of Veterinary Research, Muktesar, observed that Mr. Shahi had been using "Special Anti-Rinderpest Serum", supplies of which from Muktesar were limited and were meant

only for valuable imported animals, and that as far as possible for the purpose of controlling several reactions in buffaloes it would be better to use larger doses of ordinary serum. The Committee felt that much of the detail given regarding the work on Bhadri Kennel disease was not needed in such a report though quite suitable and necessary in an article for a scientific journal. It was considered that valuable work had been done but that more detail should have been given in the report of the work which the Director explained had been done during the year in relation to the disease of stock.

Punjab Report.

It was considered that the information obtained in regard to the incidence of Tuberculosis and Johne's disease was valuable work which should be continued and it was suggested that more statistical information might be collected from slaughter-houses in regard to this and in regard to the incidence of parasitic infections. It was pointed out that it was necessary that the warbles mentioned in the report should be confirmed by an entomologist, but the Committee considered that a valuable year's work had been done.

Bihar and Orissa Report.

Mr. Kerr wanted information, regarding the new method of branding cattle that had been employed in the Punjab, to be circulated. The Chairman explained that this had been received from America and sent to Hissar for test and the report of the Director of Veterinary Services would now be issued. It seemed likely that this method would prove of great value for marking inoculated cattle. D. V. S., Bihar, informed the meeting that horses had been vaccinated against Anthrax in considerable numbers with spore vaccine obtained from Burma, and that the results had been very satisfactory. The treatment of fluke with carbon tetrachloride was considered important and the Chairman suggested that expensive trials on this method should be carried out in order to determine its suitability for adoption for general use under field conditions all over the country.

C. P. and Berar Report.

Director of Veterinary Services explained that the work of Verterinary Investigation Officer in his province had been confined largely to Goat virus inoculations in the Saugor Sub-division, because it had been found necessary that in order to secure reliable results the systematic observations which were being carried out on goat virus inoculation under the special grant from this Council should be under his close supervision. It was agreed that this had been necessary and that valuable results had been obtained but it should be possible now to hand this work over to a considerable extent to the staff provided under the scheme and to take up more investigation work in other parts of the province. Further details as to the results of the experiments in the treatment of Bovine Trypanosomiasis were required and it was suggested that the opportunity should be taken to test out carbon tetrachloride and other drugs in the treatment of the cases of coccidiosis which were occuring in the course of the observations which were being made on goat virus inocluation against Rinderpest.

Assam Report.

Rai Sahib Ghosh stated that the V. I. O. had been mainly occupied in testing for Johne's disease which had become a serious matter in Assam at the different Government farms, village cattle and even goats had been found to be extensively affected with the disease and it was agreed that its control necessitated a great deal of careful testing and clinical examination. The need for close veterinary supervision at Government Farms and for more efficient methods of testing for this disease had been made very evident in dealing with this outbreak and it was to be hoped that the specialist officer who was being employed by the Council to deal with Tuberculosis and Johne's disease would be able to give effective help in this matter. It was agreed that the V. I. O.'s conclusion in respect of Kumri as a stage in Osteoporosis was premature and should be accepted with caution.

Hyderabad Report.

Director of Veterinary Services explained that the V. I. O. had been employed largely in testing out the field application of goat virus inoculation and that the expenditure on this disease had been greatly reduced. It was agreed that the V. I. O. had been doing valuable work in other directions also but now that Rinderpest control had been placed on a satisfactory footing he should devote more time to other investigations.

(11-45 A.M. to 1-30 P.M.—14th July, 'Rock House').

9. (*ii*) *Annual report for 1935-36 on Johne's disease investigation scheme in Mysore.*

It was observed that work under this scheme should prove of particular value if carried on in collaboration with the specialist officer who was to be appointed to deal with Tuberculosis and Johne's disease at Muktesar. It was suggested that in order to obtain information which would be of value as to the incidence of the disease, it would be necessary to issue a questionnaire covering the whole country, to all provinces and States. Animal Husbandry Expert agreed to undertake this.

9. (*iii*) *Annual report for 1935-36 on the Central Provinces Goats Virus vaccination scheme.*

D. V. S. explained that in C. P. it was intended to carry on systematic observations regarding all aspects of goat virus inoculation carried out under strict control and that the work had been concentrated in Saugor district because that was the point at which most of the annual movement of cattle into the Central Provinces took place. It was intended in time to establish quarantine stations in that area partly at the expense of the District Councils and he proposed with the help of the District Staff to extend the work now being carried out under the Council Scheme. It was suggested (1) that the Statistician, I. C. A. R., should scrutinise the statistical side of this work in which the numbers were very considerable, (2) Carbon Tetrachloride treatment for Coccidiosis that had been successfully employed in Bihar and the opportunities of testing it further which were presented by the systematic observations being carried out under this scheme should not be missed, and (3) the method of marking which had been tested at the Hissar Farm should also be given a thorough trial. The

question of charging for vaccination was discussed and it was generally agreed that for the present vaccination for the control of outbreaks should be free, but that in time it might be advisable to charge for the vaccination of all but registered pedigree animals, all of which in the interests of cattle improvement should be vaccinated at the earliest age at which permanent protection could be given.

Annual report for 1934-35 on the Punjab Parasitological schemes [Subject No. 9 (iv) of the Agenda].

It was pointed out that the names and qualifications of the officers conducting this research did not appear and should have been given in the report. The Committee felt that the number of animals under experimentation was rather small and that the number of anthelmintics to be tried should be reduced. Referring to item 6 on page 9 of the Report it was observed that in South Africa the efficacy of Kamala and other anthelmintics was increased if it was given after copper sulphate which had the effect of enabling the drug to pass more directly into the bowels. Attention was drawn to the recommendations of the Statistician, I. C. A. R., in relation to this scheme and the Committee was informed that these had been adopted as far as possible though this was not stated in the report. It was agreed that more animals were desirable but in an experiment of this kind the number must necessarily be limited by the staff available to carry out the very large number of examinations of faeces, etc., which had to be carried out daily. The Committee, however, considered that valuable data were being obtained on both the nutritional and helminthological aspects.

Application from the University of Madras for a grant of Rs. 21,300 spread over five years for a scheme for enquiry into helminthiasis of cattle in the Madras Presidency (Subject No. 10 of the Agenda) (Appendix XI).

Second part of the scheme as now presented had not been considered by the Provincial Research Committee while the first part had been modified, though only slightly. It would be necessary to refer it back. They were anxious that systematic work particularly on the life-history of helminths should be taken up in Madras but as the Madras Veterinary College had been selected by the Special Committee on Helminthiasis as the centre at which work should be carried on for South India and as the work proposed under this scheme was to be carried out under the Helminthologist at that College it seemed desirable that it should be under the administrative control of the D. V. S. who should be responsible for supervision of the work. It was considered that items 1 and 5 of the programme of work were already provided for by the College Staff and that in submitting a fresh scheme a definite programme should be given of work on the life-histories of a number of parasites (which would be named) suitable for a competent research worker to carry out during a 5 year period.

APPENDIX XI.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 2nd July 1936, on Subject No. 10 :—Application from the University of Madras for a grant of Rs. 21,300 for a scheme of enquiry into Helminthiasis of cattle in the Madras Presidency spread over a period of 5 years.

This scheme (Enclosure I) was placed before the Advisory Board in February 1936 (*vide* note dated the 19th November 1935) copy enclosed, (Enclosure I), and it was considered that it should be postponed until the summer meeting of the Board when more definite information might be available as to the proposed working of the scheme.

2. The present scheme (Enclosure II) has been prepared by the Madras Government in the light of the views expressed by the Board. It will be considered by the Veterinary Progress Reports Committee of the Council on the 13th July 1936, and its report (*vide* Appendix X) will be submitted to the Advisory Board in the usual course.

ENCLOSURE I.

NOTE BY THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, DATED THE 19TH NOVEMBER 1935, ON SUBJECT No. 39 :—APPLICATION FROM THE UNIVERSITY OF MADRAS FOR A GRANT OF Rs. 21,300 FOR A SCHEME OF ENQUIRY INTO HELMINTHIASIS OF CATTLE IN THE MADRAS PRESIDENCY SPREAD OVER A PERIOD OF 5 YEARS.

Attention is invited to the attached application (Annexure I) from the University of Madras for research into the Helminthiasis of cattle in the Madras Presidency at a cost not exceeding Rs. 21,300 spread over a period of five years. The scheme has been recommended by the Provincial Research Committee.

While forwarding the scheme, the Government of Madras have suggested that a time scale of pay, *viz.*, Rs. 125—10—175 and Rs. 55—5|2—110 should be fixed for the research scholar and the veterinary assistant surgeon instead of the fixed pay proposed by the University, *viz.*, Rs. 150 and Rs. 75. If the proposal of the Government of Madras is accepted, the total cost of the scheme will come to Rs. 20,400.

2. In August 1933, the special committee appointed to consider Dr. Thapar's scheme for an enquiry into the Helminthiasis of cattle, sheep and goats in the United Provinces, recommended *inter alia* that there should be four main centres of helminthological research, *viz.*, (1) the Imperial Institute of Veterinary Research, (2) Lucknow University, (3) The Madras Veterinary College and (4) Nagpur University, *vide* Annexure II.

3. The scheme is now for the consideration of the Advisory Board.

ANNEXURE I.

COPY OF LETTER No. 1978-III|35-8, DATED THE 25TH OCTOBER 1935, FROM THE SECRETARY TO THE GOVERNMENT OF MADRAS, DEVELOPMENT DEPARTMENT, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

A scheme for enquiry into Helminthiasis of cattle in the Madras Presidency.

I am directed to forward an application from the University of Madras for the grant of a sum of Rs. 21,300 spread over a period of five years

for a scheme to conduct an enquiry into the Helminthiasis of cattle in this Presidency. The scheme is recommended by the Provincial Research Committee. The Government of Madras support the scheme but are of opinion that, in order to sustain the enthusiasm of a research scholar, a time scale of pay is more suitable ; and consider that instead of the fixed pay of Rs. 150 and Rs. 75 suggested by the University, it will be more suitable to have scale of pay of Rs. 125—10—175 for the Research Scholar and a pay of Rs. 55—5|2—100 for the Veterinary Assistant Surgeon. The scale proposed for the Assistant is the revised scale of pay allowed to Veterinary Assistants in the Veterinary Department in this Presidency. The University has no objection to the adoption of time scales for these posts. If the University wants to employ a Departmental Officer for any of the posts it will have to provide the actual pay drawn and leave and pension contributions in respect of the officer. The estimated cost of the scheme on the basis of the time scales of pay mentioned above amounts to Rs. 20,040.

2. One hundred and fifty printed copies of the scheme will be forwarded in due course.

LETTER FROM THE REGISTRAR, UNIVERSITY OF MADRAS, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, SIMLA, THROUGH THE SECRETARY TO GOVERNMENT, DEVELOPMENT DEPARTMENT, DATED 22ND MAY 1935, No. A.-8474.

I have the honour, by direction, to apply to the Imperial Council of Agricultural Research for a grant of Rs. 21,300 for a scheme of " Enquiry into the Helminthiasis of Cattle in the Madras Presidency ". The investigation is to be carried out under the auspices of the University at the Veterinary College, Madras.

A note explaining the scheme is enclosed, and I request the favour of your placing the scheme before the Advisory Board of the Council at its meeting to be held in July next.

ENCLOSURE.

UNIVERSITY OF MADRAS.

A Scheme for Enquiry into Helminthiasis of Cattle in the Madras Presidency.

1. *Introduction.*—Very little work has been done on helminthic infections of cattle in the Madras Presidency, but sufficient data has been collected by the laboratory attached to the Madras Veterinary College to show that the condition is widespread and that many of the illnesses and debilitating effects from which cattle suffer are caused directly or indirectly by helminths. It is therefore very essential if cattle are to be kept in good health and condition that a knowledge of the helminths found in this Presidency should be known. This scheme has, therefore, been prepared with the object of finding out the prevailing helminths, the districts in which they cause most trouble, their life, histories and methods of treatment and prevention.

2. The work will be carried out at the laboratory attached to the Madras Veterinary College where ample facilities are available.

3. Materials will be collected and every assistance given by the officers of the Civil Veterinary Department, Madras.

4. The scheme will be conducted under the supervision of Mr. Anant Narayan Rao, Lecturer in Parasitology, Madras Veterinary College.

5. *Programme of work.*—The programme of work, spread over five years, is appended. It is suggested that a Veterinary Graduate be appointed to assist the Research Scholar because he will have some working knowledge of the common helminths in cattle and, being a professional man, will be useful in collecting data on the morbid anatomy of animals, etc. During the second and third years, the Research Scholar or his Assistant may have to visit some localities once in two months or so for collecting materials and to study environmental conditions.

6. *Expenditure.*—A detailed estimate of expenditure is appended. The total amount comes to Rs. 21,300.

7. *Programme of work (enquiry into Helminthiasis of Cattle in South India).*—During the first year helminths will be collected from animals slaughtered in the Madras Slaughter House, and such other places in the districts where meat inspection is held. In addition to this, worms collected during post-mortem examinaitons of cattle will also be obtained. These worms will be examined, identified and preserved. Careful notes regarding the percentage of infection in each animal and the condition of the animal before slaughter will be maintained. Notes on the localities from which the animals were obtained for slaughter, etc., will also be recorded.

8. During the second year, a study of the conditions under which helminthic ova and larvæ develop in fæcal cultures will be made. The developmental stages of the larvæ and the longevity of the ova and larvæ under normal and abnormal conditions either in the free state or in an intermediary host will be studied.

9. During the third and fourth years, experimental infection in calves with chosen helminths for study of the effects on the host and the pathological changes in the organs of the calves that may die will be made; control methods will be studied.

10. *Fifth year.*—Study of anthelminths with a view to find out the specific action of particular drugs on experimental or naturally infected animals.

The staff and expenditure spread over five years.

	Rs.	A.	P.
(1) One Research Scholar on Rs. 150 per mensem for five years ..	9,000	0	0
(2) One Veterinary Assistant Surgeon to assist the Research Scholar average salary Rs. 75 per mensem for five yeras	4,500	0	0
(3) One attendant or peon, average pay Rs. 20 per mensem for five years	1,200	0	0
(4) Travelling allowance at Rs. 500 per annum for two years ..	1,000	0	0
(5) Glassware, reagents, etc., Rs. 200 per annum for five years ..	1,000	0	0
(6) Cost of 60 calves at Rs. 5 each for all experimental work ..	300	0	0
(7) Cost of feeding 20 calves a year for three years at Rs. 5 each per mensem	3,600	0	0
(8) Cost of buckets, ropes, etc.	160	0	0
(9) Pay of a cattle attendant at Rs. 15 per mensem for three year ..	540	0	0
Total ..	21,300	0	0

ANNEXURE II.

REPORT OF THE SUB-COMMITTEE APPOINTED TO CONSIDER DR. G. S. THAPAR'S HELMINTHOLOGY SCHEME (SUBJECT No. 26), WHICH MET AT SIMLA ON WEDNESDAY, THE 9TH AUGUST 1933.

The following were present :—

1. Colonel A. OLVER, C.B., C.M.G., F.R.C.V.S., *Chairman.*
2. Mr. F. WARE.
3. Mr. P. J. KERR.
4. Major P. B. RILEY.
5. Mr. T. J. HURLEY.
6. Mr. J. H. G. JERROM.
7. Mr. W. TAYLOR. } Co-opted members.
8. Dr. G. S. THAPAR. } Co-opted members.
9. Mr. AFZAL HUSSAIN. } Co-opted members.
10. Diwan ANAND KUMAR.

The meeting of the Committee lasted from 2-30 P.M. to 4 P.M.

I. The Committee after hearing Dr. Thapar's remarks on his scheme decided to take up the question of devising the method of distributing helminthological work so as to obtain the best results. It was suggested that there are 3 main heads under which investigation is required, *viz.*, (*a*) systematic identification, (*b*) life-histories, (*c*) field investigations. The work of systematic identification might be allotted : (1) by hosts, (2) by groups of parasites, and (3) geographically, and it was eventually decided that *geographical distribution* would be the best ; with the proviso that workers should pass on any parasite in which they were not particularly interested to other institutes where they could be more thoroughly studied.

II. It was then agreed that there should be 4 main centres of helminthological research, *viz.*, (1) the Imperial Institute of Veterinary Research, Muktesar, (2) Lucknow University, (3) the Madras Veterinary College, and (4) Nagpur University. The 3 first named have agreed to the proposal, but the Nagpur University will have to be addressed in the matter.

It was decided that material from provinces and States should be distributed to these research centres as follows :—

(1) Material from Madras Presidency, Mysore and Hyderabad States, Coorg, etc., to the Madras Veterinary College ;

(2) That from Bombay, Central Provinces, Baroda and Central Indian States should go to Nagpur ;

(3) That from United Provinces, Bihar and Orissa, Bengal and Assam to Lucknow ; and

(4) That from Punjab, North-West Frontier Province, Sind, Baluchistan, Rajputana, Jammu and Kashmir to the Imperial Institute of Veterinary Research, Muktesar.

III. *Systematic identification of parasites.*—It was proposed that district staffs of provincial veterinary departments, research students of universities and others interested should be invited to carry out the systematic collection of helminth parasites and forward them in the first instance to a local centre, such as a veterinary college or university, where such existed. At these centres material would be sifted out and any requiring further identification should be forwarded to the main research centres in accordance with the distribution mentioned above. It was suggested that this Council should address Universities and acquaint them of these proposals and invite them to co-operate.

IV. *Field Investigations.*—The scheme already sanctioned for work at the Punjab Veterinary College, Lahore, was approved, and it was suggested that other Provinces might be invited to submit schemes for work of all-India importance which they would be able to take up.

V. *Life-histories.*—It was considered that life-histories of a certain number of the most important parasites should be worked out and that this should be done at the main centres already indicated.

Progress reports on the work in hand should be submitted to the Council each year, with the programme of the work proposed for the following year for consideration by the Helminthological Committee. It was considered that this Committee should be a permanent one and that to avoid overlapping, Directors of Veterinary Services should be asked to submit suggestions as to the lines on which work should particularly be taken up.

VI. Dr. Thapar's scheme was then considered in detail and certain modifications were suggested in view of the decision that his work should be confined to systematic identification and the working out of life-histories as opportunities occur. It was agreed that with these modifications the scheme should be recommended to the Board for approval.

ENCLOSURE II.

University of Madras.

A scheme for enquiry into Helminthiasis of Cattle in the Madras Presidency.

Scheme (*a*).

Introduction.—**Very little work has been done on Helminthic infections of cattle in the Madras Presidency, but sufficient data has been collected by the laboratory attached to the Madras Veterinary**

College to show that the condition is widespread and that many of the illnesses and debilitating effects from which cattle suffer are caused directly or indirectly by helminths. It is, therefore, essential if cattle are to be kept in good health and condition that a knowledge of the helminths found in this Presidency should be obtained. This scheme has, therefore, been prepared with the object of finding out the prevailing helminths, the districts in which they cause most trouble, their life-histories and methods of treatment and prevention.

The work will be carried out at the laboratory attached to the Madras Veterinary College where ample facilities are available.

Materials will be collected and every assistance given by the Officers of the Civil Veterinary Department, Madras.

The scheme will be conducted under the supervision of Mr. Anant Narayan Rao, Lecturer in Parasitology, Madras Veterinary College.

Programme of work.—The programme of work, spread over five years, is appended. It is suggested that a Veterinary graduate be appointed to assist the Research Scholar because he will have some working knowledge of the common helminths in cattle and, being a professional man, will be useful in collecting data on the morbid anatomy of animals, etc. During the second and third years, the Research Scholar or his Assistant may have to visit different localities at intervals to collect materials and to study environmental conditions.

Expenditure.—A detailed estimate of expenditure is appended. The total amount comes to Rs. 20,040.

Programme of work.—(Enquiry into Helminthiasis of cattle in South India). During the first year helminths will be collected from animals slaughtered in the Madras Slaughter House, and such other places in the districts where meat inspection is held. In addition to this, worms collected during post-mortem examinations of cattle will also be obtained. These worms will be examined, identified and preserved. Careful notes regarding the percentage of infection in each animal and the condition of the animal before slaughter will be maintained. Notes on the localities from which the animals were obtained for slaughter, etc., will also be recorded.

During the second year a study of the conditions under which helminthic ova and larvæ develop in fæcal cultures will be made. The developmental stages of the larvæ and the longevity of the ova and larvæ under normal and abnormal conditions either in the free state or in an intermediary host will also be studied.

During the third and fourth years, experimental infection in calves with chosen helminths to study the effects on the host and the pathological changes in the organs of the calves that may die will be made; control methods will be studied.

Fifth year: Study of anthelminths with a view to find out the specific action of particular drugs on experimental or naturally infected animals.

The staff and expenditure spread over five years.

	Rs.	A.	P.
One Research Scholar on a time scale of Rs. 125—10—175 per month for five years	8,700	0	0
One Veterinary Assistant Surgeon to assist the Research Scholar on a scale of Rs. 55—5|2—110, per month for five years	3,540	0	0
One Attendant or peon, average pay Rs. 20 per mensem for five years	1,200	0	0
Travelling allowance at Rs. 500 per annum for two years	1,000	0	0
Glassware, reagents, etc., at Rs. 200 per annum for five years	1,000	0	0
Cost of 60 calves at Rs. 5 each for all experimental work	300	0	0
Cost of feeding 20 calves a year for 3 years at Rs. 5 each per mensem	3,600	0	0
Cost of buckets, ropes, etc.	160	0	0
Pay of cattle attendant at Rs. 15 per mensem for three years	540	0	0
	20,040	0	0

Qualifications for Research Scholar.—The research scholar should be selected after due advertisement by a Committee composed of (*a*) Vice-Chancellor, (*b*) Director of Veterinary Services, and (*c*) Professor of Parasitology. The qualifications prescribed for this post should be—

(1) B.Sc. (Hons.) First or Second Class in Zoology with special research experience in Parasitology, or

(2) B.A. in Zoology and M.B. and B.S. with experience of Parasitology, or

(3) M.B. and B.S. and B.Sc. with special knowledge of Helminthology.

The Veterinary Assistant Surgeon will be selected by the Director of Veterinary Services, due consideration being given to his knowledge in Helminthology.

A. LAKSHMANASWAMI MUDALIYAR,
Vice-Chancellor.

SENATE HOUSE, MADRAS,
30th June 1936.

UNIVERSITY OF MADRAS.

A Scheme for enquiry into Helminthiasis of cattle in the Madras Presidency.

SCHEME (*b*).

Auxiliary scheme for the study of Anthelminthic action of plants growing in South India.

Any scheme for studying Helminthic infections of cattle would be incomplete without a systematic investigation of therapeutical agents for the treatment of animals infected with the disease. The possibilities and potentialities of medicinal plants and vegetable drugs for this purpose have not as yet been properly and fully explored. Such work as has been done on the treatment of Helminthiasis in India [Caius, Mhaskar (Bombay), Chandler, Cooper, Naik, Bhalerao (Muktesar), Verma, Sukh Dayal (Lahore), Thapar (Lucknow), Malkani (Patna), and others], has hitherto related chiefly to the action of synthetic drugs like carbon terrachloride, thymol, B-naphthol, etc., in the extermination of ova and larvæ of the worms. India abounds, however, in plants having remarkable and powerful healing qualities in the treatment of cattle maladies, and the importance of carrying out a careful survey of such plants, isolating their active principles and examining their specific action on animals infected experimentally or naturally, could therefore be hardly over-estimated.

In this scheme a list of plants reputed to have anthelminthic action has been carefully drawn up. The isolation and chemical investigation of the active principles of these plants is to be carried out systematically at the chemical laboratory of the Presidency College, Madras, where facilities for such work are available, under the guidance of Dr. B. B. Dey, Professor of Chemistry in that College. Plant materials will be collected from different parts of the Presidency with the assistance of District Forest Officers, etc., the botanical characters being determined with the help of Dr. T. Ekambaram, Professor of Botany at the Presidency College.

Programme of work, which may be spread over for four years would consist of the collection of plants, their identification and storage under such conditions as would prevent any deterioration, their extraction with solvents, firstly on small and then on a large scale, the isolation and examination of the therapeutical action of the pure active principles and finally their chemical investigation.

Expenditure.—A detailed estimate of the expenditure amounting to roughly a total of Rs. 12,000 for four years is given below :—

	Rs.
One Research Scholar at Rs. 100—10—140 for 4 years	5,520
One peon at Rs. 15—1—20 for four years ..	792
Expenses for collection of plants at Rs. 200 per year	800
Reagents (chiefly solvents) at Rs. 1,000 per year ..	4,000
Glass apparatus at Rs. 200 per year	800
	11,912

or roughly Rs. 12,000

It will be seen from the above that one research scholar and one peon only are required, the task of collecting materials from different parts of the Presidency being also entrusted to these two men.

Qualifications for research scholar.—B.Sc. (Hons.) in Chemistry with previous research experience in this type of work.

A. LAKSHMANASWAMI MUDALIYAR,
Vice-Chancellor.

SENATE HOUSE, MADRAS,
30th June 1936.

APPENDIX XII.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 1st June 1936, on Subject No. 18 (i) :—Consideration of the difficulties in securing material for plant breeding work.

A note dated 17th March 1936, by Dr. F. J. F. Shaw, D.Sc., Offg. Agricultural Expert, Imperial Council of Agricultural Research, on the difficulties in securing material for plant breeding work is attached (Annexure). This question may possibly be discussed at the British Commonwealth Scientific Conference either in 1936 or at a later date.

The subject is for the consideration of the Advisory Board.

ANNEXURE.

NOTE, DATED 17TH MARCH 1936, BY DR. F. J. F. SHAW, D.SC., OFFG., AGRICULTURAL EXPERT, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

SUBJECT :—*Consideration of the difficulties in securing material for plant breeding work.*

One of the most essential factors for success in plant breeding work is the possession of material having a wide range of variation. A wide range of variation gives the geneticist a large field from which to select suitable parents for crossing. It is for this reason that nearly all plant breeding investigations in this country, particularly those at Pusa, have started with the isolation of the unit species or types which make up the mixed *desi* crop. When, as in linseed, gram and *rahar* about 100 types have been isolated, it is possible to discover both those types which are suited to cultivation in a particular locality and those types which possess qualities, such as disease resistance, which it is desirable to combine with those of other types by hybridization. It sometimes happens that none of the types which are indigenous to a country possess a desired quality. In that case resort must be made to foreign material to obtain a parent of the requisite quality. This was the case in the breeding of improved varieties of oats at Pusa when it was necessary to use a parent from Europe, of a different species to the Indian oat, in order to produce an oat in India possessing the quality of high bushel weight. It will be fresh in the minds of members of the Advisory Board that in the I. C. A. R. scheme of potato breeding, the basis of the whole work is the obtaining of foreign material to give the investigation a wider range of variation than exists in the commonly cultivated forms.

This subject was discussed at the Third Imperial Botanical Conference in London in August 1935, where Professor Cheesman, in his paper on "The Collection and Classification of Crop Varieties and Related Species", gave as examples of the value of such work the two main crops on which the Botanical section of the Imperial College of Tropical Agriculture, Trinidad, had been working, namely, bananas and cacao, and pointed out that much valuable time and much money would have been saved if this preliminary work had been carried out previously to the commencement of the researches on these crops.

The discussion which followed showed that the importance of this question was widely realised both by institutions in this country and by delegates from the Dominions and Colonies, not merely in the examples quoted in the paper, but in the more general application of the question to crop species in general and to forage and pasture plants. The following resolution was unanimously carried :—

> "That this Conference considers the collection and classification of crops and pasture plants a matter of the highest economic and scientific importance, and it suggests that the matter be referred to the Inter-Imperial Conference to be held in 1936 with the view to the organisation of this work on an Empire scale."

Professor Cheesman's paper summarised the present position with regard to the collection and classification of varieties of cacao and banana, and pointed to the need for a satisfactory organisation for the collection and maintenance in a living state of species and varieties of the major crops of the Empire. In this connection it may be pointed out that the work of Kew on millets and on cowpeas has been directed more especially to the compilation of adequate herbarium material, and the maintenance of living material for plant breeding purposes has been a minor consideration. In the discussion which followed Prof. Cheesman's paper, the urgency of the need for the collection and maintenance of adequate living collections of the crop plants of the Empire was stressed, and it was pointed out that India possesses the largest remaining mass of unsurveyed material It was argued that if the Empire possessed adequate and properly organised collections of its own crop plants, Empire botanists would be in a position to obtain most of the important material available outside the Empire by exchange, whereas at present they have not at their disposal any large range of types to offer. The cost of maintenance of such collections would not be great, as it would be possible to divide them among Empire countries provided a central organisation such as the Imperial Bureau of Plant Genetics was in touch with all those in charge of them. It was suggested that India might undertake to maintain Empire collections of four or five crops—*e.g.*, rice, millets, sugarcane, potatoes, and one or more pulse crops, and to collect and forward to the appropriate organisations comprehensive collections of all Indian crops.

It is desirable that we should consider at this stage what is actually being done in India and has been done in the past in the way of maintaining living collections of types of crops. Plant breeding work has been in progress in most Agricultural Departments for many years and it is likely that in the case of those crops which have been investigated, collections of those types which are indigenous to a province have been made. Whether, however, they have been maintained is another matter. It is possible that only those types which have proved to be desirable in an economic sense have been kept. This, however, would not be enough for the purpose which the Third Imperial Botanical Conference had in mind since a type which possesses no desirable economic characters in India may be valuable as a parent elsewhere. It is, however, beyond the resources of most plant breeding stations to maintain living collections, of all the types isolated every year. Fortunately, it is not necessary to do this since, in most cases, seeds retain their viability for several years.

At Pusa, therefore, it has been our practice to grow the type collection of a particular crop once every three or five years. This is sufficient to maintain the types. If a request is received for seed of a particular set of types, then these types are grown in the next season if they are not growing at the time. There may therefore be a delay of about a year in supplying particular seeds. The following is a list of the type collections which are maintained at Pusa :—

Cereals—	
wheat	18 Pusa types. 94 Bihar types.
Barley	Types 1—24. There are a number of hybrids still under study.
Oats	B. S. 1, B. S. 2 and B. S. 4. Hybrids A to K.
Paddy	at Pusa. Types 1—14. at Karnal, Types 125-164.
Maize	35 types. 5 inbred lines.
Oilseeds—	
Linseed	Types 1—124. Hybrids 1—105.
Sesamum	Types 1—30. 34 hybrids are under study.
Safflower	Types 1—34.
Brassicae	
B. Campestris var. *sarson*	Types 1—33. Hybrids 1-10
B. juncea var. juncea	Types 1—61.
var. chirimonna Makino	Types 1.
var. cuneifolia	Types 6.
var. rugosa	Types 4.
Pulses—	
Rahar	Types 1—86.
Gram	Types 1-84.
Urid	Types 1—25.
Mung	Types 1—40.
Peas	Types 1—41 (sativum types). 1—31 (arvense types).
Lentiles	Types 1—66.
Tobacco	Tabacum Types 1—13 and 15-69. Tabacum Hybrids 1—10. Rustica Types 1—20 and 10 others.
Potatoes	Preliminary classification work is in progress.
Chillies	Types 1—52.
Habiscus	Types 1—13.
Ganja	Types 1-2.

At the Institute of Plant Industry, Indore, the following arrangements would be feasible.

Cotton.

The maintenance of as complete as possible a collection of the Northern Indian forms of *Gossypium arboreum* var. *neglectum* (interpreted in the wide sense adopted by Messrs. Hutchinson and Ghose in their forthcoming paper on classification). Long period types such as the Assam and Western Burmese *cernuum* or *neglectums* cannot safely be maintained here, and Madras or Bombay would be more suitable. The annual growth of each variety would be such as to give about 2 lbs. of seed of which enough would be selfed to provide for the next year's sowing.

Linseed.

Indore could maintain a fair-sized collection of Peninsular types, say, enough of each to produce 1 lb. seed of which also a part would be selfed.

Wheat.

Durum wheats could suitably be maintained at Indore.

The above sets out the nature of the problem of securing material for plant breeding and indicates what can be done by Pusa and Indore to assist workers in other stations. We require to know what part provincial Departments of Agriculture can play in this work. It is obvious that considerations of soil and climate necessitate that type collections must be largely maintained in the areas to which they are indigenous although the wide range of types and crops maintained at Pusa indicates that much may be done at even one station.

APPENDIX XII-A.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 3rd June 1936, on Subject No. 18 (ii) :—Surveys of plant breeding material.

The attached copy of a note by Dr. F. J. F. Shaw, Offg. Agricultural Expert (Annexure), is for the consideration of the Advisory Board. The subject will first be referred to a special Sub-Committee of the Board (Appendix XIII), which will be constituted by the Vice-Chairman in due course.

ANNEXURE.

NOTE DATED 27TH MAY 1936, BY DR. F. J. F. SHAW, OFFG. AGRICULTURAL EXPERT ON SURVEYS OF PLANT BREEDING MATERIAL.

A great deal of the early work of the Economic Botanists in India consisted in the classification of material and the description of the morphological types in a crop. Much of the work at Pusa has been a survey of the Indian material of the principal economic crops and the isolation and description of unit species. With the increase of agricultural research in India the isolation and description of types in a crop has been carried out at more than one centre and it is not unreasonable to assume that later investigators should make a critical comparison of their material with that of earlier workers indicating where types isolated at different place and times are morphologically identical.

It would, however, be undesirable that the same morphological type isolated in two different areas at different times should be known under only one symbol. Thus for instance a type of gram isolated at Cawnpore might be called Cawnpore 13 and a morphologically identical type isolated at Pusa might be Pusa 74 and there should never be any risk of seed which is descended from the Cawnpore isolation being described under the Pusa number because, inspite of morphological similarity, we cannot assume that physiological and agricultural characters will show a corresponding identity. Morphological characters are taken as a ready means of distinguishing between types because they are easily seen. They are, however, not necessarily the most important characters and we must remember that in Indian crop plants there exists a close adaptation between local strains and local environment (for example, the root systems of different types of barley). Each research station should have its distinct nomenclature for the different types which it isolates—generally speaking the name of the station, in full or abbreviated, *plus* a number will suffice.

It is suggested in this note that the agricultural botanist needs to approach the survey of his material from another angle, viewing the classification of his material not as a taxonomic problem but as one in applied genetics. Viewed as a problem in genetics what is important is the nature, number and frequency of occurrence, of the characters and in particular the frequency with which groups of characters are

associated together. For this reason while we suggest that the agricultural botanists should concentrate rather on a description of characters and the range of variability than on the description of types, yet it would not be desirable to abandon the description of those types which are found in the mixed crop. The latter should give us some conception of the frequency with which groups of characters are associated together and possibly give the plant breeder some inkling of those characters which may show linkage. The description of types therefore should be an essential part of a survey of material but it should be accompanied by a description of characters and their variability. In this case the work of the plant breeder in one area might very reasonably cover and be of great use to a worker in another area where the second investigator would possibly concentrate on the study of the comparison of the range of variability of the characters in the two different districts.

The weakness of a survey of plant material by the old fashioned methods of description of types is that we cannot expect such a description to be exhaustive for characters may be expected to assort themselves independently and therefore the number of possible types would be equal to the number of ways in which the characters can be combined. Suppose, for example, there are only ten pairs of factors, that is, five characters involved, there will be 2^{10}, *i.e.*, 1,024 different kinds of homozygotes and if there are 20 pairs of factors, over million kinds will be possible. This alone is sufficient to show that any description of types in a crop is only a description of those combinations of characters which the investigator happens to find in different individuals and in fact a moment's thought will remind us of the large number of new types which can be produced by hybridization between those types originally found (for example, crossing in linseed and crossing in *arhar*). If, therefore, in addition to a description of types the plant breeder surveying his material includes a description of characters, their variability and frequency of occurrence, the comparison between crop types in different parts of India would be greatly facilitated. It is also highly desirable that the results of such a survey should be summarised in a tabular form and a specimen form is appended*.

*Not circulated at the meeting.

APPENDIX XIII.

Report of the Botanical Sub-Committee, 13th July 1936.

PRESENT.

1. Dr. F. J. F. SHAW (*Chairman*).
2. Mr. L. D. GALLOWAY.
3. Mr. K. MACLEAN.
4. Mr. K. C. MEHTA.
5. Dr. B. P. PAL.
6. Mr. B. L. SETHI.
7. Mr. KADAM (*Visitor*).
8. Mr. S. K. MITRA (*Visitor*).
9. R. L. SETHI (*Visitor*).
10. Mr. THADANI (*Visitor*).
11. Mr. M. ALAM.
12. Mr. H. C. JAVARAYA.

The Committee met at Rock House at 3 P.M. on 13th July 1936.

Consideration of the difficulties in securing material for plant breeding work in India [item 18 (i) of the agenda]. (Appendix XII).

The sub-committee considered the resolution passed at the Third Imperial Botanical Conference in London in August 1935, and heartily endorsed that resolution.

With regard to the suggestion that India might maintain only four or five type collections of crops, the sub-committee was of the opinion that a much larger range of crops should be covered by the work in India not merely in the interest of empire research but for the sake of botanical work in the country. The collections maintained in India should be of those types which were indigenous in the country or had been bred from material imported and acclimatised.

The sub-committee noted that type collections of the following crops :—

Wheat, Barley, Oats, Paddy, Maize, Linseed, Sesamum, Safflower, Brassica, *Rahar*, Gram, *Urid*, *Mung*, Peas, Lentils, Pot toes, Chillies, Hibiscus, *Ganja*, could be maintained at the Imperial Agricultural Research Institute and that type collections of cotton, linseed and Durrum wheats could be maintained at Indore and would suggest that the Imperial Council of Agricultural Research address a circular letter to all provincial Departments of Agriculture enquiring what they could do in the matter of the maintenance of type collections of crops, the subject to be considered again at the next meeting of the Advisory Board. The sub-committee recognised that in the case of certain crops such as paddy, it would be impossible to maintain a representative Indian collection at one single station. A consolidated list of the type collections which were available in India would be supplied to the Imperial Bureau of Plant Genetics for communication to Empire research workers. The sub-committee would urge the early publication of the botanical descriptions of the hitherto unpublished crop collections.

Surveys of plant breeding material, item 18 (ii) of the Agenda. (Appendix XII-A.)

The sub-committee approved of the suggestion that types should be described by the name of the station at which they originated and by a number and suggested that provincial and State Departments communicate to the Imperial Council of Agricultural Research the names of their plant breeding stations and their suggestions for abbreviations of those names. In this connection, the attention of the sub-committee was called to the practice of the Railways in India of referring to stations under abbreviations. On receipt of this information, the Imperial Council of Agricultural Research would consider the list and take steps to avoid similarity in the use of the abbreviations in different provinces. Types which were established and distributed on a commercial scale in India must retain their original names or numbers for use within this country, the new number to be given in brackets for the purpose of scientific reference in the case of established varieties.

The sub-committee approved of the suggestion that the survey of plant breeding material should be viewed rather as a problem in applied genetics than as a taxonomic problem and would commend the suggestions in the note under consideration to plant breeders in India. The specimen form referred to at page 4 would be circulated along with the circular letter.

Annual report on the working of the Botanical sub-station, Karnal, for 1934-35 (not printed) [item 20 (ii) of the agenda].

The Chairman explained that the Karnal botanical sub-station did general botanical work and served as a convenient centre to try varieties bred at Pusa which did not suit Bihar conditions and which might suit North India conditions.

The sub-committee approved of the report.

Progress report for 1935-36 on the scheme of research on the cultivation of medicinal plants and the study of food poisons by Lieut.-Colonel R. N. Chopra (not printed) [item 20 (iii) of the agenda].

The sub-committee suggested that the circular letter of enquiry on the subject of the cultivation of medicinal plants might also go to well known herbalists in the country. The sub-committee noted that some progress had been made in the identification of species and in the creation of a herbarium and museum. In view of the fact that progress had been made in the botanical systematic aspect of this work, the sub-committee recommended that more strenuous efforts should be made to study the cultivation of medicinal plants.

Annual report for 1935-36 on the Hyderabad Castor Breeding scheme [item 20 (iv) of the agenda].*

The sub-committee noted that this was the first report on the scheme and was a preliminary report. They suggested that in the list of characters at the foot of page 3, dehiscence *veruss* non-dehiscence in the capsule should be included. The possible correlation of morpholo ;ical characters with oil-content should also be considered as the work progressed.

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*Not printed.

APPENDIX XIV.

Note by the Vice-Chairman, Imperial Council of Agricultural Research, dated the 11th July 1936, on Subject No. 21 (ii) :—Annual Report of the Agricultural Meteorology Branch for the year ending August 1935.

This Report was referred back by the Advisory Board at its last meeting with a request that a more detailed report should be submitted on Section III (*iv*) " analysis of crops yields and meteorological factors ". It was decided that the subject should be discussed by a Committee at the next meeting of the Board (Appendix XIV). A more detailed report was received at the end of May and sent to press but, owing to the number of diagrams which it contained, even proofs have not yet been received. As Dr. Ramdas has come up specially for the purpose, the original report will be discussed by the sub-committee with such further explanations as he is able to give. The detailed report (not printed) will be circulated to members of the Board as soon as received from the press.

APPENDIX XV.

Report of the Agricultural Progress Report Committee (Meeting held at Rock House on the afternoon of 13th July 1936).

PRESENT :

Mr. P. H. CARPENTER (*Chairman*).

Dr. W. BURNS.

Prof. P. C. MAHALANOBIS.

Dr. L. A. RAMDAS.

Mr. P. B. RICHARDS.

Rao Bahadur B. VISWANATH.

Rao Bahadur M. VAIDYANATHAN.

Annual Report for 1935-36 on the scheme of Statistical Studies by Prof. P. C. Mahalanobis. [Subject No. 21 (1) of the agenda.]*

Prof. Mahalanobis amplified and elucidated the various items of his report. The Committee found the work that Prof. Mahalanobis has done with the D^2 Statistic particularly interesting as likely to be of much value in arriving at a generalisation where several varying factors are involved. A paper is to be published in which the practical application of this statistic to various data will be given. This will materially assist those with little mathematical knowledge to appreciate its use and value.

The Committee suggested to Prof. Mahalanobis that whilst the very concise and brief method of writing the report has much advantage yet it would be of value if a short summary of the actual investigations might be given as an appendix to the report so as to enable those interested to take a more detailed interest in the work.

The Committee wish to record their satisfaction and interest in the report of the year's work and they also wish to express their appreciation of the generosity of Prof. Mahalanobis for the time and service that he has given to the training of agricultural workers who have attended at his statistical laboratory.

Annual Report (not printed) of work on the Agricultural Meteorology Branch for the year ended 21st August 1935. [Subject No. 21 (ii) of the agenda.] (Appendix XIV.)

No new report had to be considered as this unfortunately had been delayed in the printers' hands and was not yet available.

The only matters for discussion were the criticisms made in the Advisory Board meeting on 11th February 1936, on paragraphs 4(*a*) and 4(*b*) of the statistical Section III of the annual report ending 21st August 1936. Dr. Ramdas explained in some detail the manner of the experiment and the sources of the data that he used. The Committee felt that whilst they appreciated the actual statistical examination yet they were not able to unreservedly accept the conclusions which seemed in some instances not to be in agreement with agricultural experience.

*Not printed.

The Committee suggest that to obtain the full value from such investigations a very close collaboration must be established between the Statistical and Agricultural interests. It was also pointed out that in many such problems the agricultural data are insufficient for the usual statistical examination (in this case the usual correlation method could not be employed). Prof. Mahalanobis pointed out that he is studying a method for examining such statistically insufficient data which often are the only data that can be obtained from agricultural experiments, by combining agricultural experience expressed in some systematic manner with the purely statistical examination of the available data and he had great hopes that this would lead to useful methods for dealing with such results. The Committee fully appreciated the value of such an investigation.

APPENDIX XVI.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 7th July 1936, on Subject No. 12 (iii) :—Application from the Government of Orissa for a scheme of rice research in Orissa spread over a period of five years at a cost of Rs. 1,37,395.

Attention is invited to the enclosed copy (Annexure I) of a scheme from the Government of Orissa. The views of the local Government will be found in letter No. $\frac{1518\text{-E.}}{\text{IA-73.36}}$, dated the 22nd June 1936, from the local Government. The scheme involves a non-recurring grant of Rs. 12,000 and recurring expenditure of Rs. 1,25,395 spread over five years. The proposal also involves the utilisation of existing facilities at the Cuttack Sub-Station of the current Bihar Scheme—which is due to expire in January 1937—and the land, buildings and equipment available at Berhampore Rice Research Station at present under the control of the Government of Madras—which is due to expire in March 1937.

2. A proposal for the continuance of rice research work in Bihar is already before the Board separately. In that proposal, the Cuttack Sub-Station and the staff thereat which consists of one Research Assistant (Rs. 150—10—250), one Fieldman and one Plant Collector, have been omitted. The working cost of the Sub-Station is Rs. 3,000 per annum nearly, in respect of the staff and a small contingent grant. The scheme at Berhampore is at present being carried out by the Government of Madras in consultation with the Government of Orissa and is due to terminate in March 1937. No proposals for its continuance have been received from the Government of Madras.

3. A technical note by the Agricultural Expert to the Council, on the scheme, is attached. (Annexure II).

4. The scheme will first be examined by the Research Sub-Committee of the Standing Rice Committee and its report (Appendix XVII) will be submitted to the Board in due course.

ANNEXURE I.

COPY OF LETTER No. $\frac{1518\text{-E}}{\text{IA-73.36}}$, DATED THE 22ND JUNE 1936, FROM THE SECRETARY TO THE GOVERNMENT OF ORISSA, EDUCATION, HEALTH AND LOCAL SELF-GOVERNMENT DEPARTMENT, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

SUBJECT :—*Rice Research Scheme for Orissa.*

I am directed to enclose 200 printed copies of the Scheme for Rice Research for the Province (Enclosure) which has been approved by the local Government and to request that it may be placed before the members of the Advisory Board of the Imperial Council of Agricultural Research before the next meeting. The Council may kindly be moved to sanction the Scheme and allot necessary funds. The Local Government hope the Scheme will receive the sympathetic consideration of the Council.

ENCLOSURE.

An application for the renewal of the Rice Research Scheme in Orissa, as a separate scheme, for another five years (1937—42).

Introduction.—There are at present two rice research sub-stations, financed by the Imperial Council of Agricultural Research, in the new Orissa province—one at Berhampore (Ganjam) and the other at Cuttack. The Berhampore Rice Research Sub-Station is a part of the Madras Rice Research Scheme, and was started with a view to improving the paddy varieties of the district of Ganjam. It is under the administrative control of the Director of Agriculture, Madras. The sub-station at Cuttack Farm is a part of the Rice Research Scheme of Bihar and Orissa, where the main line of work has been the survey of *Dalua, Beali* and *Sarad* paddies of Orissa and isolation of pure lines from them, with a view to evolving high yielding strains suitable to Orissa conditions. The problems of selecting suitable flood and salt resisting strains of paddy, for the flooded and the saline tracts of Orissa, are also being tackled at this sub-station. The Cuttack sub-station is under the administrative control of the Director of Agriculture, Bihar, but now, as Orissa is a separate province, it will be in the fitness of things that under the changed conditions, the entire scheme for rice research should be placed under the Orissa Agricultural Department, instead of half of it being under the Government of Madras and the other half under the Bihar Government. The Deputy Director of Agriculture, who would be in immediate charge, possesses the technical qualifications and the experience required for controlling the scheme. The physiological side of the scheme would be under the guidance of the Professor of Botany, Ravenshaw College.

Importance of research in rice in Orissa.—Paddy is the most important agricultural crop in Orissa and with it is linked the prosperity of the ryots of the poor province. Of the total cultivated area in the old Orissa Division, 86 per cent is occupied by paddy alone, which percentage is much higher than in any other province in India. In the areas added from other provinces also the percentage of and cultivation with paddy is very high. This might be expected to result in Orissa being a comparatively rich country, but instead it is one of the poorest provinces in India. Two of the main causes contributing to this are the failure, up-to-now, to produce thoroughly satisfactory strains of paddy to suit the peculiar conditions of the province, and the crude methods of agriculture practised by the people. Rice research stations situated in the particular areas of the province where the different types of crops are grown will go far to remedy these deficiencies, and will have a most beneficial effect on the economic condition of the cultivators of Orissa. The main line of work is the botanical survey of the local paddies and the separation of the best indigenous types from among them, with a view to replacing the low yielding varieties by more efficient kinds. (Work on these lines is already in progress.) But the ideal will be to evolve a superior type of paddy, combining high yield with good quality. To produce this the botanist will require not only the best pure types of the local cultivated varieties, but he may have to call to his aid the various indigenous species and varieties related to the cultivated forms and have resort to hybridisation, on a small scale, to achieve the desired combinations. A collection of the improved paddies of other countries

and the most promising strains from the different paddy-growing provinces in India will prove of great help to him in bringing forth quick results.

Apart from the general line of work indicated above, there are a few problems peculiar to Orissa, on account of her geographical position, which need careful attention. These are :—

(1) Extensive areas of land in Orissa are regularly flooded during the monsoon. The varieties of paddy ordinarily grown in these tracts are of a coarse type and give poor yields even in normal years. They stand flood conditions fairly well when they are not severe, but in years of heavy flood, most of them get completely washed away in the strong current of water or rot away under prolonged submergence, leaving the poor cultivators in a helpless condition. Evolving suitable strains of paddy for these flooded tracts is an urgent need of the province and will be a great boon to the millions living in such tracts. To tackle this problem successfully in a limited space of time, will require the attention and effort of a number of research workers. The development of the root system, which brings into gear the plant and the soil and serves as an anchorage to the plant, has to be carefully studied in a number of varieties and it has to be investigated as to what type of root system is best suited to the flooded conditions. The anatomy of the stem with special reference to its tensile strength, the power of regeneration of different varieties leading to the throwing out of subsidiary tillers, the effect of continued submergence under flood water on the life processes, *viz.*, nutrition, transpiration, respiration and carbon assimilation, etc., are some of the more important problems that will have to be investigated into in this connection, so as to find out some variety or varieties which will withstand the flood conditions successfully.

To start with, a careful study of the indigenous forms, that are habitually grown in the flooded tracts, has to be carried out and strains, which combined the characters for flood resistance to the maximum degree, have to be given out for immediate use and a determined effort to be made to produce some types, which will combine the tenacity and hardiness for flood resistance, with high yield and good quality.

(2) The problems of flooded tracts are the production not only of types which will stand flood conditions but will also be able to stand the droughts—which occur in years of deficient rainfall and was the case even last year (1934-35). In such years, what little flood water comes on the land, drains off quickly and there being no other means of irrigation in those areas, the crop suffers heavily on account of drought. If a strain cannot immediately be discovered, which can stand the flood and the drought conditions equally well, experiments will have to be conducted to find two or three suitable forms of similar maturity, for being grown together in combination to meet such emergencies. Suitable mixtures of pure types are likely to do better in such tracts than single pure types.

(3) The complications, introduced by the floods in the cultivation of paddy in this province, do not end here. At many places, the flood water accumulates in the low-lying tracts, converting them into regular shallow lakes of vast dimensions, called "*pats*". Naturally nothing can be grown on such lands during the *kharif* season. It is only in the latter part of December when there is a gradual shrinkage of the water surface

that the inundated lands are gradually exposed for cultivation, in stages, of a special class of paddies, locally called "*Dalua*" from the periphery towards the centre of the area. There are about 27,000 acres of such "*pat*" land in the districts of Puri and Cuttack and hence the problem is of considerable importance. Suitable strains of paddy which will ripen within three months, have to be evolved for these tracts. The conditions under which the paddy cultivation in these areas has to be carried out, are very trying. To begin with, as the seed will not germinate when the soil is slushy, it has to be sprouted before sowing. To secure a quick and uniform germination under low temperate conditions, which prevail in the months of December and January, is a problem in itself. A speedy method of sprouting the seed, which will suit the cultivators' conditions, has to be evolved. Since, from the time of sowing to the time of harvesting, the crop has to grow under more or less dry atmospheric conditions, it has to depend on artificial irrigation carried on with the help of "swing" baskets or "*Don*" from the central sheet of water, which usually proves very expensive. A strain of paddy with the lowest possible water requirement, will have to be found out for these areas ; attention should also be given to the quality and taste of the rice, as the ordinary varieties of paddy locally grown as "*Dalua*" are considered unfit for consumption by the middle class people on account of their very coarse nature and undesirable digestion qualities. Some work on these paddies has already been done at the Cuttack Sub-Station, and some strains that have been fixed appear to be very promising but their performance has yet to be tested under varying field conditions. As there can be no last word in the matter of selection, the possibilities of finding out still better types will have to be explored.

(4) Another important problem facing us is the selection of a suitable variety of paddy tolerant to saline conditions, for growing in the saline tracts of the province, of which there are extensive areas along the coastal belt of Orissa. With this object in view, a number of recognised varieties obtained from other provinces like Bengal, Madras and Bombay, are being studied along with the local varieties grown on such lands. Experiments to find out if tolerance to saline soil conditions could be introduced in ordinary sweet-land paddy varieties, by the pre-treatment of the seeds or seedlings, are in progress. The investigations into this problem will have to be continued for sometime before any tangible results of economic importance are achieved. As a large number of saline tracts are subject to floods as well, some strains combining the two factors will have to be evolved.

(5) More than half the area of the Province is a partially excluded tract inhabited by primitive and generally poverty-stricken people. Conditions are generally favourable for agriculture but the methods adopted are very primitive. The country is hilly and there are extensive plateaus at elevations of 3,000 and 2,000 feet, besides country at lower elevations. Paddy is extensively grown but no research has been carried out as yet into the special types of paddy best suited to local conditions. Research work is likely to have very beneficial results in this area and may be of value also to the States in the Eastern Agency where conditions are somewhat similar.

(6) To solve the problem of food supply to the poorer classes—which becomes very acute in the month of June and July when their stock of

paddy from the last year's crop get exhausted—it is essential to select or evolve a very early strain of *Beali* paddy which could be sown by the end of May and harvested by the end of July. Selection of such an early *Beali* strain will not only help them in getting their food supply earlier, but the land after harvest can be cropped for the second time in the *Kharif* season for raising another suitable crop or even a crop of transplanted paddy with adequate manuring. All these possibilities will have to be explored for raising the economic condition of the ryots.

(7) Problems, relating to the application of manure and other cultural practices with regard to paddy, are of great importance and require attention. But as the inclusion of these investigations in detail will increase the cost of the scheme, Orissa will have to depend, for the time being, on the results of experiments that are being conducted in other provinces and adapt them to her conditions.

(8) There are various serious insect and fungus pests of the paddy crop and the best method to cope with them is the selection of strains resistant to the different diseases under the local conditions. This will form one of the important functions of the research staff. As regards the detailed remedial methods, however, the province will have to depend on the Imperial Entomologist and the Imperial Mycologist.

As it is impossible for the Government of Orissa to provide funds for researches of such a nature, an application is made to the Imperial Council of Agriculture Research for necessary aid. In preparing this scheme for obtaining funds from the Research Council, it has been Government's constant effort to keep the expenditure as low as possible without impairing its working efficiency. Having due regard to the importance of the different paddy problems of this province, the following arrangements for carrying out the work are proposed for the consideration of the Council of Research :—

(1) It is proposed to locate the main station of rice research at Cuttack as it is the headquarters of the Provincial Agricultural Department having a central experimental farm and the research work can be done under close supervision of the Deputy Director of Agriculture. As extensive flooded, saline and *Dalua* areas are within easy reach of Cuttack, it will considerably facilitate the working of the important problems of these crops of the province from Cuttack. Besides, the investigations into the physiological problems, connected with rice research, may be carried out in the botanical laboratory of the Ravenshaw College, where most up-to-date facilities for physiological work are available. This will save the expenditure on building and equipping a new physiological laboratory which may cost anything between Rs. 25,000 to Rs. 30,000 and may take years before it reaches the proper standard. For carrying out original researches on the physiology of rice plants, a scientist with considerable experience of plant physiology is necessary, and for recruiting a man of right type, the pay of the post will have to be very high, which will increase the cost of the scheme considerably. It is therefore proposed to recruit only a physiological assistant on a pay of Rs. 100—5—150 to work under the expert guidance of Professor P. Prija, I.E.S., of Ravenshaw College, who may be given an allowance of Rs. 50 per month for his services to rice research work.

(2) It is proposed to continue the Berhampore Rice Research Substation as a sub-station in the interest of the people of the "Ex-Madras" districts of Orissa. The work already started there should be continued for some years more in order that the useful research work which is being carried on may be completed. Conditions in Ganjam district are different from those in the coastal districts of North Orissa, and the types of paddy grown also differ. Floods are much less frequent. The proposal is to continue to maintain the sub-station but on a smaller scale. At present there are 33 acres of land attached to the sub-station, for which a sum of nearly Rs. 2,000 has to be paid annually for rent and irrigation rates alone. The present five years' lease of the land expires in February 1937, and it is then proposed to retain only 15 acres of land, including 1.5 acres of high land, on which the laboratory and the other buildings stand, thus bringing down the running cost of the sub-station considerably. Out of the five pairs of bullocks at present in this sub-station, only three pairs will be retained there and the remaining two transferred to the main station at Cuttack. The present staff at Berhampore sub-station consists of one gazetted officer, three research assistants, three fieldmen and a clerk. In the renewal scheme for which the present application is being made it is proposed to have one research assistant, two fieldmen and a sardar for the sub-station. As the main line of research will be tackled at Cuttack, the proposed staff will be sufficient to deal with the local problems.

(3) At the main station at Cuttack the Paddy Specialist with two research assistants, two fieldmen and four sardars will carry out the research work deputing some of the assistants, when necessary, to the temporary subsidiary stations, for looking after the experiments on flood and salt resisting paddies during their growing season, which will be conducted under natural conditions in the flooded and saline tracts.

The physiological assistant, as already stated, will work in the botanical Laboratory of the Ravenshaw College.

(4) It is also proposed to start a rice research sub-station at Jeypore, the most important town in the partially-excluded area in the midst of a large rice-producing tract. It is proposed that this sub-station should be provided with the same staff, equipment and acreage of land as Berhampore. The Maharajah, who is keenly interested in matters affecting the improvement of his estate and the welfare of his tenants, has promised to grant a site for the buildings free of rent for five years and to lend 15 acres of good paddy land for a similar period free of rent. It is highly desirable that this offer should be taken advantage of. A small provision has been made for buildings, for purchase of initial equipment and livestock and for the preparation of land for cultivation.

It may be mentioned here that the provincial Government will allot lands for rice research at the main station at Cuttack and will bear the cost of ordinary land cultivation, as has hitherto been the case. The facilities for physiological research work will be provided in the laboratory of the Ravenshaw College. It is hoped that the Imperial Council of Agricultural Research will provide funds for the rest of the scheme.

The claims of this minor province for help from the Imperial Council of Agricultural Research are great and reasonable. These are—

(1) Paddy is by far the most important crop in Orissa, occupying nearly 86 per cent of the total cropped area of the old Orissa Division.

(2) The problems of rice research in Orissa are very interesting in themselves and the results of these investigations may be far-reaching and of fundamental scientific importance.

(3) A large partially excluded backward tract will benefit from the results of these researches.

(4) It has been recognised by the Royal Commission on Agriculture in India (*vide* para. 572 of the abridged report) that " in the minor provinces where the administration will not pay its own way, the cost of steps taken to promote the agricultural development of these tracts must fall on the central revenue ".

(5) In paragraph 574 of the report of the Royal Commission on Agriculture it is stated " We would recommend that the Council of Agricultural Research should take a special interest in the agricultural development of these tracts. The small area of each of these tracts should make them specially suitable for trying out experiments and in this and in other ways they might well become models from which the major provinces could copy."

Estimate cost of the Rice Research Scheme for Orissa (1937—43).

Serial No.	Items of expenditure.	1st year.	2nd year.	3rd year.	4th year.	5th year.	Remarks.
		Rs.	Rs.	Rs.	Rs.	Rs.	
	RECURRING.						
	(A) MAIN STATION, CUTTACK.						
I	Staff and Establishment—						
	(*i*) Paddy Specialist on Rs. 200—40/2—480	2,400	2,400	2,880	2,880	3,360	
	(*ii*) Physiologial Assistant (one) on Rs. 100—5—150	1,200	1,260	1,320	1,380	1,440	
	(*iii*) Research Assistant (two) on Rs. 80—4—100	1,920	2,016	2,112	2,208	2,304	
	(*iv*) Fieldman Overseer (one) on Rs. 45—3—48—4—100 ..	768	816	864	912	960	
	(*v*) Fieldman (one) on Rs. 40—3—85 ..	480	516	552	588	624	
	(*vi*) Sardars (four) on Rs. 20—1—30 ..	960	1,008	1,056	1,104	1,152	
	(*vii*) Laboratory Assistant (one) on Rs. 15 per month ..	180	180	180	180	180	
	(*viii*) Clerk (one) on Rs. 30—2—40.. ..	360	384	408	432	456	
	(*ix*) Peon (two) on Rs. 10 per month.. ..	240	240	240	240	240	
II	Travelling Allowance ..	1,500	1,500	1,500	1,500	1,500	
III	Allowance for the Professor of Botany for guiding physiological research @ Rs. 50 per month ..	600	600	600	600	600	
IV	Field working expenses and other contingencies ..	2,500	2,500	2,500	2,500	2,500	
V	Laboratory	500	500	500	500	500	
	Total ..	**13,608**	**13,920**	**14,712**	**15,024**	**15,816**	

Serial No.	Items of expenditure.	1st year.	2nd year.	3rd year.	4th year.	5th year.	Remarks.
	RECURRING.						
		Rs.	Rs.	Rs.	Rs.	Rs.	
	(B) SUB-STATION, BERHAMPUR.						
I	Staff and Establishment—						
	(i) Research Assistant (one) on Rs. 80—4—100	960	1,008	1,056	1,104	1,152	
	(ii) Fieldman (two) on Rs. 40—3—85 ..	960	1,032	1,104	1,176	1,248	
	(iii) Sardar (one) on Rs. 20—1—30 ..	240	252	264	276	288	
	(iv) Peon (one) on Rs. 10 per month	120	120	120	120	120	
II	Travelling Allowance ..	250	250	250	250	250	
III	Field working expenses and other contingencies	2,875	2,875	2,875	2,875	2,875	
	Total ..	5,405	5,537	5,669	5,801	5,933	
	(C) SUB-STATION, JEYPORE.						
I	Staff and Establishment—						
	(i) Research Assistant (one) on Rs. 80—4—100	960	1,008	1,056	1,104	1,152	
	(ii) Fieldman (two) on Rs. 40—3—85 ..	960	1,032	1,104	1,176	1,248	
	(iii) Sardar (one) on Rs. 20—1—30 ..	240	252	264	276	288	
	(iv) Peon (one) on Rs. 10 per month ..	120	120	120	120	120	
II	Travelling Allowance ..	250	250	250	250	250	
III	Field working expenses, and other contingencies ..	2,000	2,000	2,000	2,000	2,000	
	Total ..	4,530	4,662	4,794	4,926	5,058	
	GRAND TOTAL	23,543	24,119	25,175	25,751	26,807	

NON-RECURRING EXPENDITURE.	Rs.
(a) A small field laboratory with *pucca* threshing floor at Cuttack	4,000
(b) Laboratory and office equipment at Cuttack..	2,000
(c) Wire fencing for the land at sub-station, Jeypore	1,000
(d) Erection of buildings at Jeypore	3,500
(e) Initial equipment, purchase of bulls and preparation of land for cultivation at Jeypore.	1,500
Total ..	12,000

	Rs.
Grand Total ..	1,37,395
Average for one year ..	27,479

ANNEXURE II.

NOTE BY THE OFFG. AGRICULTURAL EXPERT, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, ON THE ORISSA RICE SCHEME.

(1) Items 1—6 in the programme relate to the breeding of varieties of paddy to suit special conditions of the area. These are legitimate objects of research. Item 8, however, is in a different category. The programme makes no attempt to justify this item and does not mention any diseases which are preventive to Orissa and can only be dealt with by breeding resistant types on the spot. This item should for the present be deleted from the programme and Imperial Mycologist and Imperial Entomologist consulted as to the diseases indigenous to Orissa and not occurring elsewhere.

(2) The scheme proposes—

(1) One enlarged station at Cuttack.

(2) Continuance of station at Berhampore, on a reduced scale.

(3) A new station at Jeypore.

Cuttack :—

The staff proposed is :

1 Paddy Specialist.
1 Physiological Assistant.
2 Research Assistants at Headquarters.
2 Fieldmen

as against

1 Senior Assistant.
1 Fieldman.
1 Plant Collector.

A case has not been made out for 2 Research Assistants and the number may be reduced to 1. The proposal to pay Professor Parija Rs. 50 per mensem should also be deleted. Similar cases exist of supervision of entire schemes by Officers of Imperial Institute of Agricultural Research but no extra allowance is given. It will probably be necessary to give the Paddy Specialist more than the initial pay of Rs. 200.

Berhampore—the proposal may be accepted.

Jeypore.—No case has been made out for this sub-station. If Cuttack and Berhampore were sufficient for this area before the creation of the province they should (Cuttack being enlarged) be sufficient now. The rice problem is not affected by changes in political boundaries. The research necessary for the partially excluded tracts can be carried out at the other stations and by tours in the partially excluded tracts.

Non-Recurring Expenditure.

This is Rs. 12,000 mostly for buildings—in accordance with Imperial Council of Agricultural Research rule this should be borne by the local Government.

The changes proposed above will reduce the total cost of the scheme to almost Rs. 93,000 giving Orissa a grant about equal to that of the Central Provinces. The amount which Orissa asks for (Rs. 1,37,395) is nearly as large as the cost of the Bengal scheme and larger than that of Madras.

The actual cost of existing schemes and proposed extensions is shown below :

Co-ordinated Scheme of Rice Research in India.

Province.	Sanctioned amount.		Amount asked for in extension proposal.	Remarks.
	Original.	Revised.		
	Rs.	Rs.	Rs.	
Bengal	1,64,822	1,56,322	1,41,333 }	*half the cost is met by His Majesty's Government.
Burma	2,41,736*	2,18,266*	.. }	
Bihar and Orissa	2,02,140	2,02,140	1,56,374 for Bihar only.	
			1,37,395 net for Orissa only.	
Assam	1,38,790	1,17,882	....	
Madras	1,15,660	1,15,660	....	
United Provinces	1,50,460	1,39,660	....	
Central Provinces	1,08,800	91,927	....	
	11,22,408	10,41,857		

APPENDIX XVI-A.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 12th June 1936, on Subject No. 12 (i) :—Application from the Government of Bihar for extension of the Rice Research Scheme, Bihar, for a further period of five years from 20th January 1937 at a cost of Rs. 1,56,374.

Attention is invited to the enclosed copy of a scheme from the Government of Bihar (Annexure I). The views of the local Government will be found in the extract (attached) from letter No. 360-D.R., dated the 27th May 1936. from the local Government (Annexure II).

2. The original Scheme was sanctioned in 1931 and work was started on the 20th January 1932. The reports for the years ending 1934-35 have already been examined by the Advisory Board (*vide* previous proceedings of the Advisory Board). The report for the year 1935-36 is being placed before the Board* separately. The question of future arrangements for Rice Research in Orissa will require simultaneous consideration as the Berhampore Rice Research Station (under the Madras Scheme) is situated in the new province of Orissa. A supplementary note on this point will follow.†

3. In September 1935, the Governing Body of the Council considered the question of provincial contributions to renewal schemes of this kind and resolved that "every Scheme should be examined on its own merits and that the Province concerned should be asked to shoulder a part of the obligations when the utility of the scheme to the province was proved". In February 1936, the advisory Board after considering progress reports on certain rice research schemes resolved that "local Governments should be required to make a contribution on the basis of 50 : 50 in all cases of renewals of these schemes". The local Government have expressed their inability to bear any expenditure and have asked the Council to bear the full share (*vide* attached extract from the local Government's letter).

4. The subject will first be discussed by the Research Sub-Committee of the Standing Rice Committee and its report (Appendix XVII) will be submitted to the Board in due course.

ANNEXURE I.

EXTENSION OF THE RICE RESEARCH SCHEME FOR BIHAR.

The Rice Research Scheme for Bihar and Orissa was sanctioned for a period of 5 years at a total cost of Rs. 2,02,140 by the Imperial Council of Agricultural Research. It started working on 20th January 1932 and will thus complete its period of 5 years work on 19th January 1937.

The main objects for which the scheme was ssanctioned are :—

1. A Botanical Survey of the Rices grown in the province.

2. Isolation of pure-lines of all the rice varieties grown in Bihar and Orissa.

***Subject No. 11 (iv).**

†A separate scheme for the province of Orissa was received and considered by the Advisory Board (Appx. XVI).

3. The production of improved strains by selection and hybridization.
4. Cultural and Manurial experiments to supplement the work being done at the departmental farms.
5. Study of the inheritance of characters in rice, and
6. Study of the physiology of the rice plant.

A programme of work was laid down. The details of the work done and the results achieved are given in the annual reports which have been submitted to the Imperial Council of Agricultural Research and approved. Report on the work done in the 4th year is being submitted separately. Results from the 5th years' working of the scheme cannot be got ready till April 1937. As, however, the present scheme ends in January 1937 it will be difficult if not impossible to submit these results unless the scheme is extended.

No plant breeding scheme can achieve all it sets out to do within the comparatively short space of 5 years and particularly so in the case of work on a crop in which a start is made with almost a blank sheet. Such schemes require a great deal of preliminary work in addition to the training of the staff in the details of the technique before one can tackle the actual problems. Whether the Bihar and Orissa Rice Research Scheme has achieved that measure of success which could be expected from it can be judged from the results achieved which are summarised below. This summary not only fully justifies the expenditure incurred so far but furnishes a strong reason for its continuance. Material is now available for tackling the more serious problems and the staff has been fully trained to carry out the work involved. If for any reason the scheme is not extended it will mean that the total anticipated expenditure of Rs. 1,82,094 which will have been incurred will have been thrown away. The major results achieved are—

1. Botanical Survey of the paddy varieties grown in Bihar and Orissa has been completed.

2. The varieties collected have been grown in line cultures for the last two seasons and a detailed study of their botanical and agricultural characters has been undertaken. The number of varieties being large (about 3,000) and the nature of some of the characters being very complex the isolation of pure lines of these varieties will require another 3 or 4 seasons work.

Before the rice research scheme started working the Economic Botanist had in hand a number of varieties grown in South Bihar. This work was handed over to the rice scheme and it has been thus possible to establish some 200 pure strains from this material. Some of these appear very promising as they have given statistically significant higher yields over the existing standard varieties.

3. A complete knowledge of the blooming of paddy flowers under Bihar conditions has been gained. This is essential for future hybridization work.

4. The inter-relationship between root and shoot of paddy plant is now well understood as a result of root studies of different paddy varieties under diverse growth conditions. This knowledge will now be utilized in selecting suitable strains for the diverse tracts of the province.

5. Isolation of pure lines of *Dalua* (summer) paddies for Orissa has been accomplished and some of these appear to be very promising.

6. Studies on dormancy and viability of paddy seeds has been undertaken and the relation existing between temperature and germination percentage has been studied.

7. Preliminary work has been undertaken to study the problems connected with the selection and for breeding of varieties suitable for saline and flooded tracts.

8. The most suitable shape and size of individual strips for carrying out varietal and manurial trials has been worked out.

9. Supplementary experiments on the spacing and number of seedlings per hole in the case of transplanted rice have confirmed the results obtained on the departmental farms in the past.

10. Supplementary manurial trials have confirmed that Amm. Sulphate or Ammophos are equally good and decidedly better than Nitrate of Soda or Superphosphate in the case of transplanted rice under South Bihar conditions.

11. Preliminary work on the study of inheritance of characters in rice has been started during the last two years.

Proposals for extension of the scheme—

From the foregoing summary of major results achieved it will be seen that although a good deal of work has been done it is essential to continue work on the present lines if results of real economic value are to be achieved. At least 5 years further work is necessary to clarify the varietal position and make a preliminary selection of strains of economic importance suited to the various rice tracts. It is therefore proposed that the present scheme of work be extended for another five years to achieve these results.

This scheme deals with the province of Bihar only and the total expenditure involved during the next 5 years amounts to Rs. 1,76,420. Details of this expenditure are given in the attached statement. With the opening of a sub-station at Ranchi for the Chota Nagpur conditions the staff at the main station is more than fully occupied to permit of any new items to be added to the existing programme. In fact the Rice Specialist urges the need of one more Senior and one more Junior Research Assistants at the main station. Provision for the additional staff has been deferred mainly on grounds of financial limitations. Economies have also been effected in other directions and both the contingent expenditure and travelling allowance grants have been considerably reduced. The estimated expenditure is the minimum necessary for the work in hand.

The scheme as sanctioned by the Imperial Council of Agricultural Research was estimated to cost Rs. 2,02,140. The actual expenditure is expected to amount to Rs. 1,82,094. The savings of Rs. 20,046 is due mainly to lower expenditure on the salary of the Rice Specialist and partly to economy in the details of expenditure. If credit is allowed on account of these savings the net expenditure will amount to Rs. 1,56,374 for the next five years.

D. R. SETHI,

Director of Agriculture, Bihar.

Details.	6th year from 20th January, 1937.	7th year.	8th year.	9th year.	10th year.	Total.	Remarks.
1	2	3	4	5	6	7	8
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
ESTABLISHMENT.							
Rice Specialist (Rs. 560—40—720).	6,720	7,200	7,680	8,160	8,640	38,400	The incumbent of this post, Mr. M. Alam, is a member of the Bihar Agricultural Service Class I. He will be in his 9th year of service on 20th January 1937 and the pay admissible to him in Class I would be Rs. 440. As Rice Specialist he has been drawing Rs. 550 from 20th January 1936 and so he has been allowed the next increments admissible in Class I Service.
1 Assistant Botanist (Rs. 330—40/2—410).	3,960	3,960	4,440	4,440	4,920	21,720	
1 Physiologist (Rs. 330—40/2—410).	3,960	3,960	4,440	4,440	4,920	21,720	
1 Senior Research Assistant (Rs. 180—7—218).	2,280	2,364	2,448	2,532	2,616	12,240	
1 Junior Research Assistant (Rs. 100—4—116).	1,200	1,248	1,296	1,344	1,392	6,480	
1 Junior Research Assistant (Rs. 90—4—106).	1,080	1,128	1,176	1,224	1,272	5,880	
2 Fieldmen (Rs. 60—4—76).	1,440	1,536	1,632	1,728	1,824	8,160	
1 Fieldman (Rs. 56—4—72).	672	720	768	816	864	3,840	
2 Senior Plant Collectors 1 (Rs. 33—2—41) & 1 (Rs. 27—2—35).	720	768	816	864	912	4,080	
2 Junior Plant Collectors 1 (Rs. 16—1—20) & 1 (Rs. 20—1—24).	432	456	480	504	528	2,400	
Total Staff ..	22,464	23,340	25,176	26,052	27,888	1,24,920	
Travelling Allowance ..	1,500	1,500	2,000	2,000	2,000	9,000	
Contingencies ..	7,000	7,000	7,000	7,000	7,000	35,000	
Total recurring ..	30,964	31,840	34,176	35,052	36,888	1,68,920	
Non-recurring for Physiological apparatus equipment						7,500	
Total ..						1,76,420	
Anticipated saving from the present grant of Rs. 2,02,140						20,046	
If credit is allowed by the Imperial Council of Agricultural Research the net expenditure which they will have to meet will be						1,56,374	

ANNEXURE II.

EXTRACT FROM LETTER No. 360-D.R., DATED THE 27TH MAY 1936, FROM THE SECRETARY TO GOVERNMENT, BIHAR, EDUCATION AND DEVELOPMENT DEPARTMENT, TO THE SECRETARY TO THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

SUBJECT :—*Extension of the Rice and Sugarcane Research schemes in Bihar.*

I am directed by the Government of Bihar (Ministry of Education) to submit for the consideration of your Council and allotment of funds, proposals for the renewal of the Rice and Sugarcane Research Schemes in Bihar for a further period of five years. These schemes have at present been sanctioned by the Imperial Council of Agricultural Research for a period of five years which will end on the 19th January 1937, and 17th March 1937, respectively. Research schemes of such importance cannot be expected to bear fruit in this short period and the local Government agree with the Director of Agriculture, Bihar, that if they are not continued the money already spent on them by the Council will be wasted. This would be very unfortunate as both schemes have given hopes of good results in the future.

2. For the Rice Research Scheme the local Government have provided the lands and buildings. This they will continue to do if it is decided to extend the term of the scheme.

* * * * * * * * *

3. At the meeting of the Governing Body of the Imperial Council of Agricultural Research held on the 2nd September 1935, it was suggested that provinces should be asked to contribute on a 50 : 50 basis towards the cost of a research scheme, the term of which was being extended. The representative of this Government could not attend the meeting as the local council was then in session. The local Government have not heard anything officially from the Imperial Council of Agricultural Research on this point and they assume that no final decision has yet been reached. They take this opportunity of stating their objections to the adoption of any such proposals which would favour the richer at the expense of the poorer provinces, irrespective of their agricultural importance. In Bihar financial stringency has been so acute that many schemes for agricultural development which were considered both urgent and necessary have had to be postponed indefinitely. If assistance from the Imperial Council of Agricultural Research is dependent on provincial contribution, research activities of an important character which are likely to be of value to other provinces besides Bihar which will have to be curtailed before the full advantages of the work have accrued. In the circumstances, I am to express the hope that at least so far as these two important schemes are concerned, the question of a further contribution from the local Government will not be pressed, and that the Imperial Council of Agricultural Research will take a broad view.

APPENDIX XVI-B.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 18th June 1936, on Subject No. 12 (ii) :—Application from the Director of Agriculture, Bengal, for a Grant of Rs. 1,41,333 spread over five years for the extension of the Rice Research Scheme in Bengal.

Attention is invited to the attached copy of a scheme from the Director of Agriculture, Bengal (Annexure), containing a proposal for the extension of the Rice Research Scheme, Bengal, for a peiod of five years from April 1937, at a gross cost of Rs. 1,62,274, of which it is proposed that Rs. 1,41,433 should be provided by the Council. The recommendations of the Local Government and the Provincial Agricultural Research Committee have been called for and will be circulated as soon as received.

2. The original scheme was sanctioned with effect from April 1932, at a gross cost of Rs. 1,56,322 in co-operation with the late Empire Marketing Board (whose financial liabilities upto March 1937, were taken over by His Majesty's Government) on a fifty-fifty basis. The scheme was started in April 1932, and the cost to the Council upto March 1937, will amount to about Rs. 1,34,900. The progress reports for the years 1932-33, 1933-34 and 1934-35 have already been examined by the Board (*vide* previous proceedings of the Advisory Board). The report for the year 1935-36 is being placed* before the Board separately.

3. In September 1935, the Governing Body of the Council considered the question of provincial contributions to renewal schemes of this kind and concluded that " every scheme should be examined on its own merits and that the province concerned should be asked to shoulder a part of the obligations when the utility of the scheme to the province was proved ". In February 1936, the Advisory Board after considering progress reports on certain rice research schemes resolved that " local Governments should be required to make a contribution on the basis of 50 : 50 in all cases of renewals of these schemes ".

4. The subject will, in the first instance, be discussed by the Research Sub-Committee of the Standing Rice Committee and its report (Appendix XVII) will be submitted to the Board in due course.

(ANNEXURE.)

PROPOSAL FOR THE EXTENSION OF RICE RESEARCH SCHEME FOR BENGAL AT CHINSURAH AND BANKURA.

(From 1937-38 to 1941-42.)

It is a well-known fact that Bengal is a deficit province as regards rice production. When a bumper crop is harvested (which is of fairly rare occurrence) the supply meets the demands or may be slightly in excess. Otherwise there is a considerable deficiency. The policy of the Government is to increase the yield of the crop by the introduction of departmental varieties and improved and up-to-date methods without attempting to increase the area under rice (for which there is very little scope). In order

*Cancelled.

to effect this, rice breeding is being carried on at Dacca on Eastern Bengal and Northern Bengal rices for a quarter of a century by the Agricultural Department, Bengal. As a result of this a number of high yielding types have been evolved and distributed to cultivators, the estimated area under these types being over half a million acres with an estimated increased yield of 1½ million maunds. But this is not sufficient to meet the deficiency for the whole of the province. To meet this requirement, necessity was felt to start rice breeding work at Bankura and Chinsurah on Western Bengal rices and *Patnai* paddies. A start was made and some progress was effected on their study, before the founding of the Imperial Council of Agricultural Research in India. On the inception of the Imperial Council, the present scheme was submitted by this department to complete the rice research work in hand at the above two stations for this portion of the Province. The scheme was sanctioned for five years by the Imperial Council of Agricultural Research and the work was started in the year 1932.

The present Bengal Rice Research Scheme was sanctioned for completion of rice work in Western Bengal and also for a thorough investigation into the improvement of *Patnai* paddy and other varieties which make up the *Patnai* rice of Commerce with a view to complete a general Rice Research Scheme for India. Two centres—Chinsurah and Bankura—were selected in West Bengal for carrying out the work of the scheme. It may be mentioned that besides the above two main centres, necessity for two more sub-stations, one attached to each station, was felt for the following reasons : (1) That at Bankura Farm the area available was not large enough to include all the experiments of the scheme ; so a sub-station was opened at Suri Farm, where a certain number of experiments are being carried out under the supervision of the Rice Research Officer, Bankura ; (2) That neither of the centres selected was quite suitable for the investigation into the improvement of *Patnai* paddy. An arrangement therefore was made at Gosaba Farm with the kind consent of Sir Daniel Hamilton, where work on the varietal tests of the selected and improved strains of *Patnai* paddy were being carried out under the supervision of Rice Research Officer, Chinsurah—the preliminary selection work having been already done at Chinsurah.

The scheme was sanctioned from April 1932, for a period of five years. The staff for conducting the work were appointed in June 1932, and so far at present the fourth year of the scheme is nearly finished. In the following paragraphs a brief survey of the progress of the work and results achieved from the various experiments of the scheme at the two stations is submitted.

CHINSURAH.

Survey and collection.—Start was made with 578 single plant cultures and 154 new collections. At present the number has risen to 1,636. Of these, 1,380 were already established pure-lines. These include almost all the different strains of *Patnai* paddies of the *Patnai* rice growing tracts of the Sundarbans, and also from the important rice growing centres in the districts of Burdwan, Hooghly, Khulna, Howrah and 24-Parganas where samples of paddy varieties with special reference to trade requirements were collected. Promising strains are being selected every year from the pure-lines for trial in the yield tests while detailed notes on Botanical and

Agricultural characters are taken of the pure-line cultures. All these are necessary not only for the selection towards the improvement of the rice varieties but also for working out the classification of rices of West Bengal without which it may be urged, Rice Research Work for India remains incomplete. It may be submitted that it would require at least another five years so as to make the best use of all the data that have been collected so laboriously and at the cost of so much money. It would not be out of place, if it is mentioned that it took over 20 years to complete the classification of rices of East Bengal by Dr. Hector, and it may be judged from this, the long time, this nature of work takes to complete. It is expected, however, from the progress of work so far made to complete the work of classification of rices of West Bengal by 1942 if the scheme be extended up to that time by the Imperial Council of Agricultural Research.

2. *Varietal Tests on Aus and Aman rice including Patnai rice test in Sundarbans area (Gosaba) according to the modern system of layout.*—These are being done in two stages : (I) Preliminary test, (II) Field scale test :—

(1) *Preliminary Aus test.*—Up to the present time seven selected pure-line strains were tested against one standard local variety. The result so far showed that Bhutmuri 36 was the only *Aus* which was significantly superior.

(2) *Field Scale Aus test.*—Four selected strains of *Aus* were treated against *Kele* the local variety. Here again *Bhutmuri 36* is positively superior.

(3) *Preliminary Early Aman test.*—Nine selected strains were treated against local *Nehara.*

Nagra 41/14, Dudsar, Latisail and *Jhingasail* are all significantly superior to the local variety.

(4) *Preliminary Aman test.*—There were 23 selected strains against two local varieties, *e.g.*, (I) *Local Nagra,* (II) *Local Patnai.*

The mean grain yields of all the strains in the test are more than that of the local *Nagra* and as many as fourteen selected strains are significantly superior. While *Nagra 41/14, Patnai 298* and *Patnai 23* (Gosaba) are the only strains which are positively superior to local *Patnai* though the mean grain yields of twelve selected strains are more than that of the local *Patnai.*

(5) *Field Scale Aman test.*—The selected strains were tested against local *Nagra* and local *Patnai.*

The mean grain yield of all the strains in the test, with exception of D. M. 124 are more than that of local *Nagra.* But *Dudsar Nagra 68/6* and *Nagra 41/14* are the only strains which are significantly superior. The mean yield of *Patnai 23* (Gosaba) is more than that of local *Patnai.*

It will be realised from the above statement that a good number of selected strains of paddy varieties of West Bengal seems to be promising. But before definitely deciding as to their suitability as recommended strains it is necessary that they should be under test for several years more to enable us to know definitely about their good performance.

3. *Complex Cultural Experiment.*—The experiment was conducted for two to three consecutive years. Certain useful conclusions have been arrived at. It was observed that in both the seasons transplanting in August 1st, gave the highest yield ; July 16th, and August 16th, at an interval of one month, gave practically identical yields but were each inferior to the August 1st. Early September was considerably worse than each of the first three while the last transplanting in middle of September was a failure in 1933-34 although not so bad in the second year. In 1933-34, the closer the spacing the greater was the yield, especially when the planting was late. In the second year, which was a good season for the rice crop, the effect of spacing was altogether marked. Exactly the same thing occurred for the number of seedlings. In other words a close spacing and a large number of seedlings insure against a bad season, especially when the planting is late, but is otherwise of no practical value in a good season.

4. *Field Technique.*—Certain definite conclusions have been arrived at from (*a*) Uniformity trial—an elaborate uniformity trial experiment was conducted on an area of one acre of land, and the following results were obtained :—

(I) The S. D. of individual plot decreases as the area of the plot increases.

(II) The change of shape of a plot makes for no significant change in the accuracy of the experiment.

(III) A block size of 60′ × 33′/(1/22 acre) eliminates heterogenety to a minimum ; for all sizes of plots the minimum S. D. occurs, with this particular orientation of the block ; with a block size of 60′ × 33′, a plot size of 15′ × 33′ (1/88th acre gives the precision of 3.181 and with 10 replications it would come up to 1.057. From (*b*) Border effect and method of harvesting :—

(I) For all strains the yield of the outermost ring is remarkably high while the yield of the 2nd and other inner ring are less than half of the first, so that the border effect is concentrated on the outermost ring only.

(II) *Harvest on the basis of 100 plants.*—100 plants areas are practically identical in the estimate of mean yield of the strains as well as in the precision obtained.

(III) The safest plan of harvesting would be the area basis to the exclusion of the outermost border ring only.

5. *Hybridization.*—Several crosses have been made to evolve high yielding strains of rice that conform to trade requirements and also to study the inheritance of economic characters. It may be mentioned that it requires a number of years to come to a definite conclusion regarding the fixity of particular desirable hybrid ; consequently another five years' work will be essential to obtain some definite results regarding the evolution of desirable hybrids.

BANKURA.

1. *Establishment of Pure-line.*—Here the present collection of rice varieties and strains has come up to 881. The collection is yet far from exhaustive as some areas of Midnapore, Burdwan and Birbhum have not yet been explored. The collection so far made is at various stages of study and in order to make it complete, to establish the purity of the selections, to obtain a complete knowledge of their characters and relative efficiencies for selection some more years are needed. It is doubtful whether even by 1942 the work will be properly completed.

2. *Selection Series.*—86 strains of rice are being tried out for further selection from them, for four different soil situations. The result of this experiment will enable us to select properly strains for suitable situation of lands.

3. *Varietal Tests.*—Unlike Chinsurah, here the work on varietal tests has been confined to one stage only, *viz.*, preliminary tests of *Aus*, early *Aman*, Inter *Aman* and late *Aman*.

In *Aus* test, 9 selected early maturing strains were tested against early local. Some of the selected strains have significantly higher yield than the local ; and *Badkalamkati 7*, maintains its position at the head of the list. In the early *Aman* and inter *Aman* tests there are twenty strains in each of which one was local. In late *Aman* test, there were twelve strains of which one was a local variety.

4. Complex cultural experiments were being done in their different lines, *viz.* :—

(I) *Aus* high land—the effect of broadcast sowing, dibbling, and transplanting different ages of seedling on the yield of early maturing strains.

(II) The effect of planting different numbers of seedlings per hole in early normal and late planted crops.

(III) The effect of planting seedlings of different ages early, normal and late planted crops.

It may be mentioned now that the results of the above varietal and cultural experiments over three and in some cases four successive years have revealed the remarkable influence of weather conditions on the yields of grains and straw. This has rendered generalization from a few years' experiments extremely risky and it is therefore proposed to study the behaviour of promising selections over a number of years covering a wide range of weather conditions. These will supply information regarding the response and performance of strains in relation to the weather factor which is very necessary before recommendations can be made on one or more varieties.

5. *Hybridization work.*—The hybridization work that has been started (with American and local varieties) will require a further number of years of study for a complete exploration of their possibilities.

Conclusion.—In this four years a considerable amount of research has been done at both the stations. Annual reports have been submitted to the Imperial Council of Agricultural Research, where they have always been favourably approved of. Now, in view of the facts that (*a*) the results of the last four years have been very promising, (*b*) selected new strains of required paddies are consistently doing well but require considerably more testing, and (*c*) that the technique and equipment is now so well established that the work can now be done more efficiently, it is hoped that definite selected and tested types will have been obtained and the bulk of the work accomplished in another five years. The sum total of the work will ultimately greatly help Bengal to become a self-supporting if not an exporting province as regards rice production, and that the completion of rice research scheme in Bengal will complete the general rice research scheme for India, which the Imperial Council of Agricultural Research have agreed to do. The case for an extension of the Rice Research Scheme of Bengal for another period of five years from April 1937, to March 1942, is thus submitted. Considering the importance of Rice Research Scheme for Bengal and the valuable results that have already been achieved (for the list of publications please see Appendix V), confidence is felt that the Imperial Council of Agricultural Research will consider with favour the present case for continuance of the rice research scheme for another period of five years.

Expenditure.—A detailed estimate of recurring expenditure for Rs. 1,41,433 for the proposed extension of the Rice Research Scheme at Chinsurah and Bankura for a period of five years is given in the Appendix I.

In the scheme which is still in force, the expenditure of the Local Government works out as follows up to the end of five years :—

	Rs.
Non-recurring expenditure	1,145
Recurring expenditure	19,895
Total ..	21,040

Approximate details of these are shown in Appendices Nos. II and III.

For a further five years' period it is very unlikely that the recurring expenditure of the Local Government will be less than the amount of Rs. 20,841.

Again it is not possible at present to foresee what non-recurring expenditure may be necessary, but it may be assured that as in the past all such requirements will be met.

The expenditure falling in the share of the Imperial Council of Agricultural Research is for a total of Rs. 1,41,433. Leaving the increment in the pay of the staff no increase has been proposed. A statement of the total receipt realised from sale proceeds for three years with the proportionate share of the Imperial Council of Agricultural Research and Bengal Government has been given in Appendix IV.

APPENDIX I.

PROPOSED EXPENDITURE FROM THE IMPERIAL COUNCIL OF AGRICULTURAL SCHEME, BENGAL.

Last or 5th year's sanction of the current grant.	Name of posts.	6th year.	7th year.	8th year.	9th year.	10th year.	Remarks.
Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	
7,800	2 Rice Research Officers (Rs. 330—20—430).	8,280	8,760	9,240	9,720	10,200	Increment on 1st June.
3,600	Senior Rice Research Assistants—						
	1 Chinsurah (Rs. 190—10—240).	2,310	2,430	2,550	2,670	2,790	Increment on 9th December.
	1 Bankura (Rs. 190—10—240).	2,370	2,490	2,610	2,730	2,850	Increment on 1st June.
	Field Assistants—						
735	1 Chinsurah (Rs. 62—3—77).	771	807	843	879	915	Ditto.
600	1 Bankura (Rs. 62—3—77).	768	804	840	876	912	Increment on 10th July.
720	2 Fieldmen (Rs. 34—2/2—38).	816	852	864	900	912	Increment on 1st June.
312	2 Peons (Rs. 14—1/5).	330	336	336	336	336	Ditto.
3,000	Travelling allowance ..	3,000	3,000	3,000	3,000	3,000	
	Supplies and Services.						
525	1 Seeds, plants, manures and implements. 2 Chemicals and apparatus.	525	525	525	525	525	
7,340	Contingencies ..	7,275	7,275	7,275	7,275	7,275	
135	Purchase of books ..	200	200	200	200	200	
24,767	Total ..	26,645	27,479	28,283	29,111	29,915	—Rs. 1,41,433.

APPENDIX II.

NON-RECURRING EXPENDITURE FROM LOCAL GOVERNMENT.

Miscellaneous.

	Rs.
Microscope	**750**
Micrometer screw	**20**
Furniture	**75**
Husking machine, Winnowing machine and Grinding machine	**300**
Total	**1,145**

APPENDIX III.

Details of Recurring expenditure from Local Government for five years (1932-33 to 1936-37).

	Rs.
Pay of Fieldman at Chinsurah and Bankura from 1st June 1932 to 31st March 1937	4,368
Pay of one Preparer at Chinsurah from 1st June 1932 to 31st March 1937 ..	1,328
Chinsurah.	
Travelling allowance.—Travelling Allowance at Rs. 75 per year for 5 years ..	375
House allowance at Rs. 11 per mensem (the Fieldman at Rs. 5 per mensem and the Preparer at Rs. 6 per mensem) for 5 years	660
Contingencies at Rs. 1,000 per year for 5 years	5,000
Stationery grant at Rs. 15 per year for 5 years	75
Bankura.	
Travelling allowance.—Travelling allowance at Rs. 50 per year for 5 years ..	250
House allowance at Rs. 5 per mensem for 5 years	300
Contingencies at Rs. 1,500 per year for 5 years..	7,500
Stationery grant at Rs. 15 per year for 5 years	75
	19,931

APPENDIX IV.

	Total sale proceeds.	Council's share.	Bengal Government's share.
	Rs. a. p.	Rs. a. p.	Rs. a. p.
For 1932-33, ,, 1933-34, ,, 1934-35	already credited.		
	3,388 8 6	2,826 11 3	561 13 3

APPENDIX V.

(Chinsurah.)

Published.

1. **Complex cultural experiment** on rice, 1933-34.

To be published.

1. **Complex cultural experiment** on rice, 1934-35.
2. **Comparative study** of the complex cultural experiments for 1933-34 and 1934-35 by the method of convariance.
3. **Uniformity trial experiment** on rice conducted on an area of one **acre of land.**

APPENDIX XVI-C.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 7th July 1936, on Subject No. 12 (ii)—Supplementary :—Application from the Director of Agriculture, Bengal, for a Grant of Rs. 1,41,333 spread over five years for the extension of the Rice Research Scheme in Bengal.

In continuation of the note, dated the 18th June 1936 (Appendix XVI-B), the following letter from the Government of Bengal, No. 4232, dated 4th July 1936, is circulated for the information of the Advisory Board :—

> " I am directed to refer to your letter No. F.-45-17|36-A., dated the 5th June 1936. and enclosure, regarding the extension of the Rice Research Scheme for Bengal at Bankura and Chinsurah and to say that the Provincial Research Committee approves the scheme and that this Government recommends the extension of the scheme on existing conditions."

APPENDIX XVII.

Report of the Rice Research Sub-Committee, held on 14th July 1936

PRESENT :

Sir BRYCE BURT (*Chairman*),

Rao Bahadur ANANDA RAO,

Mr. M. ALAM,

Mr. R. G. ALLAN,

Rao Saheb Dr. D. V. BAL,

Mr. H. L. DUTTA,

Mr. M. R. FOTIDAR,

Dr. S. HIDAYATULLAH,

Mr. B. S. KADAM,

Dr. B. N. IYENGAR,

Mr. K. MACLEAN,

Dr. S. K. MITRA,

Mr. K. P. PILLAI,

Dr. B. L. SETHI,

Mr. R. L. SETHI,

Dr. F. J. F. SHAW,

Mr. R. WATSON.

Visitors.

Rai Bahadur W. C. CHOPRA,

Dr. N. R. DHAR,

Professor P. PARIJA,

Rai Saheb K. I. THADANI.

The meeting commenced at 10-30 A.M.

Application from the Government of Orissa for a scheme of rice research at a cost of Rs. 1,37,395 [item 12 (iii) of the agenda]. (Appendix XVI.)—The Sub-committee recommended—

(1) that the Physiological Assistant should be a Research Assistant to Professor P. Parija for both physiological and histological work on flood resistance in paddies,

(2) *Item 1 (iii)* that the number of Research Assistants should be reduced from two to one,

(3) that the Imperial Council of Agricultural Research were not able to provide an allowance for the Professor of Botany at the Ravenshaw College,

(4) that items (*viii* and *ix*) relating to the provision of clerk and peon should be met by the Local Government in accordance with the ordinary practice,

(5) *item (vii), Section 1*—that the title of " Laboratory Assistant " should be changed to " Laboratory Attendant ",

(6) that the present Assistant at Cuttack should be retained in the scheme as First Research Assistant on pay of Rs. 200—7—228, and

(7) that unless the Assistant Botanist in the Bihar scheme is transferred to Orissa the Paddy Specialist's post should be recruited through the Public Service Commission in India and the initial pay in the sanctioned scale should be up to Rs. 320 according to qualifications and experience.

The Sub-committee are unable to recommend the inclusion of the Jeypore sub-station in the scheme as the work to be done at it is part of the normal work of a local experimental farm which can appropriately be provided by the Local Government.

The Sub-committee recommended that the area of the Berhampore station should be retained at the present figure of 33 acres, the Local Government paying the rent. Without the full area, the multiplication of improved strains could not be satisfactorily carried out. The Sub-committee recommended that for the scheme as now modified the Local Government provide the non-recurring expenditure, rent of land, pay of clerks and peons, the Research Council providing the rest. They recommend that the scheme be sanctioned for three years only in view of the impending review of the Imperial Council of Agricultural Research's work. This would reduce the grant required to approximately Rs. 61,000.

The Director of Agriculture, Madras, brought to the notice of the Sub-committee the fact that Berhampore station had hitherto served both the Ganjam district now transferred to Orissa and Vizagapatam district which remained in Madras. The Sub-committee recommended that varieties bred at Berhampore should be made available to the Madras Department of Agriculture, equally with Orissa, for testing in Vizagapatam district.

Application from the Government of Bengal for a grant of Rs. 1,41,333 spread over a period of five years for the extension of the rice research scheme in Bengal [item 12 (ii) of the agenda]. (Appendix XVI-B and XVI-C.)

The Sub-committee recommend that the scheme be renewed for three years only and that the Local Government be invited to contribute 50 per cent; this being the proportion of the total cost of the scheme which was previously met by the Empire Marketing Board. This would reduce the grant required to approximately Rs. 47,000.

Application from the Government of Bihar for extension of the rice research scheme, Bihar, for a further period of five years from 20th January 1937, at a cost of Rs. 1,56,374 [item 12 (i) of the agenda]. (Appendix XVI-A.)

The Sub-committee recomended that the post of Assistant Botanist be abolished and the present incumbent be transferred to Orissa as Paddy Specialist. (This affects the recommendation made in the Orissa scheme.)

An additional Junior Research Assistant in the scale Rs. 80—4—100 should be allocated to the Bihar scheme to compensate for the loss of the Assistant Botanist. The sum provided for physiological apparatus and equipment should really not appear in the renewal scheme being part of the savings of Rs. 20,000 on the first five years which it was now desired to re-allocate.

The Sub-committee recommended the renewal of the scheme for three years, the Local Government contributing 50 per cent of the cost. This reduces the grant required from the Imperial Council of Agricultural Research to Rs. 31,276 allowing for savings of Rs. 20,046 — 7,500 = Rs. 12,546 on the original scheme.

Progress report (not printed) of the Bihar and Orissa, 1935-36 [item 11 (iv) of the agenda].

The Sub-committee noted on page 4 of the report the 7 items in which results had been achieved.

The Sub-committee recommended that the Statistician to the Research Council might compare the layout of experiments in this annual report with that in previous annual reports and furnish up a note on the subject.

With regard to the programme of work under Botanical, item 6, the Sub-committee desired to emphasise that this work should be carried out on a particular set of plots and not by any attempt to correlate meteorological observations with yields over a large area. In section 5 the work under "cytology" should be deleted from the programme. The Sub-committee recommended that work on items 4 and 5 in the Physiological section of the programme should not be continued in this scheme but should be carried out in Orissa.

In the manurial experiments, the Sub-committee would call attention to the fact that the use of Ammophos was not necessarily the same as the application of equivalent quantities of Ammonium sulphate and Super.

The Sub-committee suggested that, in the event of the scheme being continued for three years, the manurial experiments in this report might be examined by the Soil Science Committee.

The Sub-committee approved of the programme and the report.

Report (not printed) of work done at Coimbatore in connection with the investigations on the quality of rice, item 11 (vi) of the agenda.—

The Sub-committee noted that the experience at Nagina with regard to the effect of storage and the time taken to cook rice did not agree with the conclusion in this report.

The Sub-committee noted that the work under this scheme was being carried out by the appointment of a separate Assistant out of the provision existing for the Madras Rice Research Scheme. It was obvious that when Orissa rice scheme comes into operation, it will not be possible to maintain this Assistant out of the grants from the Berhampore farm. The Sub-committee considered that this question should be considered in relation to the continuance of the work on the quality of rice at Bangalore. This report does not bring out clearly the relation of the work on quality at Coimbatore to the work at Bangalore and the work being done in connection with the rice marketing survey and suggest that the Director of Agriculture might furnish a supplementary note on this point.

APPENDIX XVIII.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 3rd June 1936, on Subject No. 23 (iii) B :—Programme of Work for the Horticultural Research Station, Krishnagar, Bengal, for the year 1936-37.

In February 1936, the Advisory Board considered the annual report of the Horticultural Research Station, Krishnagar, Bengal, for the year 1934-35, and recommended that the Director of Agriculture, Bengal should be asked to submit, for consideration at the next meeting of the Board, a definite programme of work and the proposed layout of the station for the Council's approval (*vide* printed proceedings of the Advisory Board). The Director of Agriculture has accordingly submitted the attached programme of work for 1936-37 (Annexure I). This has been examined and, as it still appears to be overloaded, an enquiry has been made from him as to

(*i*) whether he obtained any statistical advice, in the layout of the field experiments ;

(*ii*) which replicated experiments have actually been planted out and which can wait until the programme has been considered by the Advisory Board in July 1936 ;

(*iii*) whether the programme should not be reduced so as to be more within the capacity of the land and staff available ; and

(*iv*) whether attention has been paid to the work already done at Poona on stocks and methods of propagation, in drawing up the present programme.

2. His reply is attached (Annexure II).

ANNEXURE I.

PROGRAMME OF WORK OF THE HORTICULTURAL RESEARCH STATION AT KRISHNAGAR—1936-37.

1. Study of desirable varieties :—Mango—(*Mangifera indica Linn.*).

(*a*) *Collection and trial of varieties* :—Reputed varieties from Bombay, United Provinces, Bihar, Madras and local varieties from Maldah, Murshidabad, Nadia, and Berhampore will be obtained and planted and will be under observation to record their behaviour.

(*b*) Grafts for irrigation experiments will be obtained after studying the mother plants in reliable orchards at Maldah, Murshidabad and such other places and irrigation experiments will be carried out as per plan attached herewith. (Plan No. 1).

2. Propagation.—Mangoes (*Mangifera indica Linn.*).

(*a*) Survey of seedling orchards to obtain good stones for raising seedlings, of high productivity, desirable fruit quality vigour, etc.

(*b*) Methods of raising seedlings by sowing by different methods.

(*c*) Transplanting of seedlings.

(*d*) Relative vigour of seedlings transplanted in different ways and methods.

(*e*) Raising of seedlings in beds and in pots to determine their suitability as stock for grafting operations.

(*f*) Trials of budding on different ages of stock and at different periods of the season and month.

(*g*) Trials of different methods of grafting.—

1. Inarching.
2. Crown grafting.
3. Double working.
4. Top working.

(*h*) Other systems of mango propagation :—(Vegetative).

1. Layering.
2. Gootic.
3. Stooling.

Litchi. (*Litchi Chinensis.*).

1. Collection and trial of varieties.—Reputed varieties from Bihar, Saharanpur, Maldah, Murshidabad and Nadia will be planted and will be kept under observation.

Citrus varieties.

1. *Citrus Auruntium*—Malta Orange plants have been secured from a reliable source having the same stock and scion and planted to see the effect of lime in different doses and at different depths in the pits.

The following is the details of treatment.—

Treatment No.	Depth of pit.	Treatment.
1	3 ft. depth	10 mds. of lime per acre.
2	6 „	30 mds. of lime per acre.
3	9 „	60 mds. of lime per acre.
4	6 „	1st 3 ft. at 10 mds. per acre and 2nd 3 ft. at 30 mds. per acre.
5	9 „	1st 3 ft. at 10 mds. per acre and 3 ft. at 30 mds. per acre.
6	Control.	3rd 3 ft. at 60 mds. per acre.

All other treatments are equal. For layout—plan and randomized chart is enclosed. • (Plan No. 2).

2. Varietal trial.—Several suitable varieties of limes, lemons and Oranges are planted and are kept under observation to study their behaviour.

Guavas (Psidium guava Linn.).

1. Varietal trials.—Several good and desirable varieties are planted and are kept under observation to study their behaviour.

Annuals.

1. Papaya—(*Carica Papaya Linn.*).

(*a*) Varietal Trial.—Desirable varieties have been planted and are under observation and their yield and other requisite data is being collected. The work will be continued.

(*b*) Planting Experiment.—Different times of planting with one desirable variety will be tried to find out the suitable season for transplanting the seedlings.

(*c*) Transplanting experiment.—To find out the effects at numerous transplanting of the same seedlings in different places.

(*d*) Experiments will be undertaken to determine the possibility of grafting in different ways.

(*e*) Experiments to reverse the sex of the male to female will be undertaken.

(*f*) Hybridization experiment to study heterosis or hybrid vigour.

(*g*) Study of seedlings to determine their sex in early stages before transplanting.

Pineapple (Ananassa Sativa Linn.)

1. Varietal trial—Varieties of best quality were obtained and have been planted and are under observation for their behaviour and acclimatization. The following varieties are being tried.—

(*a*) Mauritius Spineless.

(*b*) Kew Pine.

(*c*) Queen.

(*d*) Jiant Kew.

(*e*) Golden Queen.

2. Experiments.—Manurial, cultural and liming and irrigation, non-irrigation experiments have been laid out and the following manures singly and in combination are being given.—

(*a*) 1. Nitrogen.
2. P_2O_5
3. K_2O
4. Nitrogen $+ P_2O_5$
5. Nitrogen $+ K_2O$
6. Nitrogen $+ P_2O_5 + K_2O$
7. $P_2O_5 + K_2O$
8. Control.

(*b*) In the same experiment irrigation and non-irrigation experimet is combined.

(*c*) The cultural experiment—of growing the pineapples on ridges and furrows is also combined in the same manurial experiment.

(*d*) Charcoaling and non-charcoaling of the pineapples to give sufficient drainage and friability to the soil is also combined in same.

(*e*) Liming at the rate of 10 mds. and 30 mds. per acre is also combined in the same experiment.

For the layout, randomization and details :—

The plan No. 3 accompanying herewith will show everything clearly.

3. Study of best propagation materials.—Whether any one kind of the following suckers give the best desired results.—

a. Suckers.

b. Crown.

c. Rhizomes.

d. Suckers below the fruit.

e. Slips.

4. Hybridization experiment.—Crossing of two good varieties—Mauritius Spineless × Giant Kew or the Golden Queen to obtain a variety of desired characters and flowers.

Bananas (*Musa Sapientum*).

1. Survey of orchards to obtain best varieties.

2. Collection of varieties and their trials. Several Bengal, United Provinces, and Coimbatore varieties were obtained and are being studied as to how they behave. Some of these can be acclimatized.

3. Study of keeping qualities of Banana fruit.

Fruit of all the varieties under trial will be examined for their keeping qualities and also methods will be devised so as to increase the keeping qualities of Banana fruit.

Tomato (*Lycospernum, esculentem Mill*).

1. Selection work to obtain a desirable early and one late variety for the plains of Bengal has been undertaken. Performance records are being maintained and seed for further isolation and pure line culture has been collected. The work will be continued. Field work with a view to study and collect material for the classification of Bengal Mango and Litchi varieties. This will be done in conjunction with the Economic Botanist, Bengal.

Areas under different fruits and experiment.

		Acres.
1.	Pineapple varietal plots	0.55
2.	Papaya Experimental plots	0.47
3.	Citrus Block	1.10
4.	Mango varietal and irrigation experimental plots ..	1.61
5.	Pineapple experimental plots	1.30
6.	Litchi varietal	1.10
7.	Kept in reserve	0.90
8.	Path, spaces, drains and wind breaks, etc.	2.57
		9.60

Experimental total area (enclosed area).

ANNEXURE II.

Replies from the Director of Agriculture, Bengal, to the Enquiry regarding Programme of Work.

1. Statistical advice of Professor Mahalanobis was secured in laying out the plots of the experiments of more or less complex nature.

2. The following replicated experiments have not yet been planted out :—

(*i*) Mango irrigation experiment—1 (*b*) of programme of work for 1936-37.

(*ii*) Varietal trials on litchi—(Litchi—1, 1936-37).

(*iii*) Planting experiment of papaya [Papaya (*b*)—1936-37].

(*iv*) Varietal trial of bananas—(Banana 2, 1936-37).

Planting can wait till July next.

3. The programme has been considerably reduced and is within the capacity of the staff. As regards the land, 9.60 acres of the fenced portion has been sown only. More land is available and will be fenced as soon as it will be required for experimental purposes.

4. Full attention has been paid to the work already done at Poona on stocks and methods of propagation in drawing up the programme. Yet it has been found necessary to repeat some of them to know their performance under edaphic and climatic conditions of the province. In this connection it may be pointed out that the Horticultural Officer was trained at Poona.

APPENDIX XIX.

Report of the Fruits Sub-Committee held at Rock House on 15th July 1936.

PRESENT :

Dr. F. J. F. SHAW, *Chairman.*
Professor S. P. AGHARKAR.
Mr. R. G. ALLAN.
Dr. W. BURNS.
Dr. G. S. CHEEMA.
Professor N. R. DHAR.
Mr. M. R. FOTIDAR.
Mr. L. D. GALLOWAY.
Dr. HIDAYATULLA.
Dr. B. N. IYENGAR.
Mr. H. C. JAVARAYA.
Mr. J. C. McDOUGALL.
Mr. K. McLEAN.
Mr. S. K. MITRA.
Mr. A. M. MUSTAFA.
Colonel E. W. C. NOEL.
Mr. P. V. RAMIAH.
Mr. RAMDHAN SINGH in place of Khan Bahadur FATEH-UD-DIN.
Mr. P. B. RICHARDS.
Mr. D. R. SETHI.
Mr. G. T. TAIT.

The meeting commenced at 10-30 A.M.

Programme of work for the Horticultural Research Station, Krishnagar, Bengal, for the year 1936-37 [*item 25* (*iii*) *B of the agenda*]. (*Appendix XXII.*)

The Sub-Committee recommended the following changes in the programme of work :—

Mangoes (*i*) that the work on mangoes should be restricted to item 1 (*a*)—collection and trial of varieties—and that, in view of the fact that research work on mangoes was proceeding under the Bihar scheme, the remainder of the programme under mangoes should be deleted ;

(*ii*) that work on propagation by grafting and budding might be carried out by the staff as far as their resources permitted.

Litchis (*i*) that the collection and trial of litchis should be restricted to field observations, and

(*ii*) that replicated experiments should not be embarked on in the first few years of the scheme but the plots should be laid out so as to allow a study from the point of view of replication in later years.

The sub-committee recommended that in the work on papaya, the items from (*d*) to (*g*) be deleted. The sub-committee noted that land was available for extension of work on bananas at the expense of the local Government.

The sub-committee decided that, in view of the work on the storage of fruit in Bombay, item (3) on bananas might be deleted.

The sub-committee were of the opinion that, work under tomatoes should consist of the testing of known and established varieties and that selection work and pure line work were not required.

Final report on the scheme of research on Wither Tip of Citrus trees by Dr. Chaudhri [item 23 (iv) of the agenda].*

The sub-committee noted that there were various references to entomological matters in this paper and considered that it would be desirable that in all papers which contained any detailed references to entomological matters the manuscript should be sent to one of the entomological referees. On the general question all papers dealing with a particular subject containing extensive references to other subjects should be scrutinised by a specialist officer in the subject referred to. The sub-committee noted that the writer had not tested the method of dealing with chlorosis which was used in Florida and which had been described by Dr. Camp.

First report on the work done under the fruits and vegetables preservation scheme, Punjab [item 23 (v) of the agenda].*

The sub-committee recommended that in future reports the names of varieties of fruits should be correctly spelt.

The sub-committee drew attention to the use of preservatives which were prohibited in many civilised countries, and considered that it was undesirable that they should be encouraged in India where they might get into the hands of people who were less appreciative of their injurious properties than the Fruit Specialist.

The sub-committee felt doubtful about the estimate of cost of jam at page 5 and they also felt that at page 2 the total cost per bottle appeared low considering what the cost of an empty bottle would be.

The sub-committee desired a more detailed statement of the cost in future reports.

The sub-committee recommended that the Fruit Specialist should pay some attention to the methods of extracting juice and concentrating it in use in Rhodesia.

The sub-committee would recommend the inclusion in the programme of work of the method of concentration of juices and would refer again to the work done in Rhodesia and to the publications of the University of California on this subject. Subject to the above criticisms the report was approved.

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*Not printed.

Application from the Government of the Punjab for a grant of Rs. 29,820 spread over five years for a scheme for a survey and control of fruit diseases in the Punjab by Dr. Chaudhri, Punjab University (item 24 of the agenda). (Appendix XX.)

It was proposed that the scheme be rejected in view of the fact that it was too general, that the Punjab Agricultural Department possessed a Mycological Assistant and that the work could be done without expense to the Imperial Council of Agricultural Research with the assistance of the Imperial Institute of Agricultural Research, Mycological Laboratory.

An amendment was issued that a scheme of a much more limited character dealing with a specific disease or with the diseases of specific groups of fruit trees might be invited from the author.

On being put to vote the amendment was lost.

The sub-committee decided that the scheme was of too general a nature, that the work could be done by assistance from the Imperial Department of Agriculture and by the local Mycologist of the Punjab Department and that they could not recommend the scheme to the Advisory Board.

The scheme was rejected.

Application for the extension of the Bombay cold storage research scheme of a period of three years with effect from 1st March 1937, at a total cost of Rs. 50,188 [item 31 (a) of the agenda]. (Appendices XXI and XXI-A.)

The sub-committee approved of the report and considered that very useful work had been done under this scheme. The sub-committee noted that there were various items of scientific information which required further study. These had emerged in the course of the work which had been in progress up to date. The sub-committee also noted that the officer in charge of the cold storage scheme at Bombay had been requested to do work for other provinces and States in India and that there was a reasonable prospect that the continuance of the scheme might lead to the development of the export trade in mangoes and other fruits and to the regulated supply of all fruits within India. The sub-committee recommended and the Director of Agriculture, Bombay Presidency, accepted the suggestion that cold storage work for provincial Departments of Agriculture and States should be included in the programme of each year. In view of the all-India importance of this work the sub-committee recommended very strongly that the entire cost of the scheme amounting to Rs. 50,188 be met from the funds of the Research Council.

Application from the Government of Bombay for a grant of Rs. 11,019 spread over three years for a scheme of gas storage of fruits and vegetables [item 31 (b) of the agenda]. (Appendices XXI-B and C.)

The sub-committee thoroughly approved of this scheme and considered that it was essential to send an officer to Europe for training and that on his return, a detailed scheme should be submitted to the Advisory Board as it was possible that changes and additions in the equipment of the scheme as submitted would be suggested by this officer in the light of his experience. The sub-committee also considered that it would be an

advantage to have the opinion of the scientific expert from Europe before the scheme was put into force. Subject to this criticism the scheme was cordially approved. The sub-committee recommends that steps should be taken to send the selected officer to Europe for training at once.

Application for the extension of the scheme for experiments on the preservation of fruits and vegetables in the Punjab at a cost of Rs. 12,970 spread over two years with effect from the 9th November 1936 [item 31 (c) of the agenda). (Appendix XXI-D.)

The sub-committee approved of the scheme and recommended it to the Advisory Board subject to the condition that the Local Government provided the salary of the new Assistant and 50 per cent of the remaining cost.

It was moved that the sub-committee do not recommend this scheme for renewal with Council's funds but that it be left to the Local Government to finance the scheme. The amendment having been lost, the original motion stood "that the sub-committee recommend the scheme to the Advisory Board subject to the condition that the pay of the new junior Research Assistant be provided by the Local Government and that the contribution of the Council be limited to 50 per cent of the total cost of the scheme less the salary of the Junior Research Assistant, *viz.*, 50 per cent of Rs. 10,810 ".

APPENDIX XX.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 19th May 1936, on Subject No. 24:—Application from the Punjab Government for a Grant of Rs. 29,820 spread over five years for a scheme for a survey and control of fruit diseases prepared by Dr. H. Chaudhri. (Punjab University.)

The scheme (Enclosure) as described in the Punjab Government letter No. 226-D., dated the 27th January 1936 (not printed), involves non-recurring expenditure of Rs. 4,000 and recurring expenditure of Rs. 25,820, or a total expenditure of Rs. 29,820, spread over a period of five years, and has been approved by the Punjab Council of Research by a majority. The contribution from the local Government will be (*i*) necessary laboratory accommodation at the University, (*ii*) a room for storing of cultures and (*iii*) extra apparatus not provided for in the scheme.

ENCLOSURE.

REVISED SCHEME FOR THE SURVEY OF THE DISEASES OF THE FRUIT TREES OF THE PUNJAB AND THE STUDY OF THE DISEASES WITH A VIEW TO CONTROL.

In Punjab cultivation of fruit trees is developing rapidly and is a paying proposition. The Punjab Government has also started several fruit schemes. As all these trees are subject to different diseases it is necessary that a proper survey of the diseases of the important fruit trees in the Punjab should be taken up. When investigating the 'Wither-tip disease of the Citrus' financed by the Imperial Council of Agricultural Research several other important diseases of citrus were also noted and from this laboratory two new important diseases of the pomegranates have already been described.

Disease-causing organisms are always present and if not checked will cause epidemic and great loss. These have got to be watched. It is proposed to have (*a*) survey of the diseases of the orchards in representative fruit-growing centres in the plain as well as in the hills of the Punjab and (*b*) to study the fungi as isolated from the air of the orchards in different centres and from the different plants (except those which have already been studied, *e.g.*, certain diseases of the citrus and grape vines).

The study of the life-history of the organisms will be taken up along with artificial inoculation of the potted plants to prove that the pathogens have been isolated.

Effect of various fungicides on culture will be tested in the laboratory. If successful, this may be tried on a field scale by the Agricultural Department. There will not be any duplication of work at present carried out by the Lyallpur Agricultural College and Research Institute.

If the scheme is approved, it is proposed to have (1) a herbarium where all diseased specimens will be preserved, (2) a culture room where cultures of all the fungi that will be isolated will be maintained throughout and will be available to any worker in the province, in India or abroad.

Last year, I specially visited the Fungus Culture Bureau, Baarn (Holland) and the Lister Institute in Chelsea (London) where cultures are maintained. I could easily train up a person who could look after even 3,000 different cultures and keep them pure and alive with the help of just a laboratory assistant. Here cultures of Fungi isolated not only in connection with the scheme but also of other pathogenic fungi isolated by the different workers in the agricultural and other laboratories will be stored and maintained. This in itself will prove a great boon to the workers in the province.

The cost of the scheme for a period of five years is estimated to be Rs. 29,820.

(*a*) *Non-recurring* :—

		Rs.
(*i*) Cost of a temporary pot culture house	..	2,000
(*ii*) Extra equipments ..	..	2,000
Total	..	4,000

(*b*) *Recurring* :—

——	1st year.	2nd year	3rd year.	4th year.	5th year.	
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1. Research Assistant, M. Sc., 100—10—200.	1,200	1,320	1,440	1,660	1,680	7,200
2. Culture Room Assistant, B. Sc., 55—5—100.	660	720	780	840	900	3,900
3. Fieldman 30—3—50 ..	360	396	432	468	504	2,160
4. Laboratory Assistant, 30—3—50.	360	396	432	468	504	2,160
5. Part-time typist Clerk, Rs. 20 per mensem.	240	240	240	240	240	1,200
6. Mali, Rs. 16—2—24 ..	192	216	240	254	288	1,200
7. Travelling expenses	1,000	1,000	1,000	1,000	5,000	5,000
8. Supplies, Services and Contingencies.	600	600	600	600	600	3,000
Total ..	4,612	4,888	5,164	5,440	5,716	25,820

		Rs.
1. Non-recurring	.. ..	4,000
2. Recurring	.. ..	25,820
	Grand total ..	29,820

The work will be carried on under the direct supervision and control of Dr. H. Chaudhri, Head of the Department of University Teaching in Botany. The University will provide the necessary laboratory accommodation and also room for storing of cultures and extra apparatus not provided in the scheme.

The cost of the scheme amounting to Rs. 29,820 will have to be met by the Imperial Council of Agricultural Research, India.

DR. H. CHAUDHRI,

University Reader in Botany.

4th December 1935.

APPENDIX XXI.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 25th June 1936, on Subject No. 31 (a) :—Application for the extension of the Bombay Cold Storage Research Scheme, for a period of three years with effect from 1st March 1937, at a total cost of Rs. 50,186.

In July 1932, the Advisory Board recommended the Bombay Cold Storage Research Scheme, for sanction (*vide* printed proceedings, pages 43, 391—403), and it was approved by the Governing Body at a total cost of Rs. 90,154 spread over a period of three years in October 1932. The scheme was actually started on the 1st March 1934 and is due to terminate on the 28th February 1937. The present establishment consists of :—

1 Senior Research Assistant @ Rs. 220—10—300.

1 Junior Assistant @ Rs. 150—5—200.

1 Senior mechanic @ Rs. 130—10—200.

2 Junior mechanics @ Rs. 48—7/2—90, per mensem each.

2 Laboratory Assistants @ Rs. 30—5/2—80 per mensem each.

3 Trained coolies @ Rs. 30 per mensem each.

1 Peon at Rs. 18 per mensem.

1 Boy peon at Rs. 11 per mensem.

2. The above establishment has been provided in the present extension scheme (Annexure) which involves a total expenditure of Rs. 50,188 spread over a period of three years. The views of the local Government, through whom the extension scheme has been submitted, are still awaited and, if received in time, will be placed before the Advisory Board in the meeting. The annual report on the scheme for 1935 is being submitted to the Board separately [subject* 23 (*i*) of the agenda].

3. The application will first be examined by the Fruit Sub-Committee whose report will be submitted to the Board in due course. (Appendix XIX.)

ANNEXURE.

SCHEME FOR THE EXTENSION OF THE COLD STORAGE RESEARCH SCHEME AT THE GANESHKHIND FRUIT EXPERIMENT STATION, KIRKEE.

The work of this station in its first two years has been described in the reports for these years which have been approved by the Imperial Council of Agricultural Research. The Cold Storage Research Station was visited in October 1935, by Sir Bryce Burt, Vice-Chairman of the Imperial Council of Agricultural Research, who expressed himself as pleased with its progress and who made very helpful suggestions for its future activities. The report of the third year's work is in preparation, but will not be ready until the end of the current mango storage season.

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*Cancelled.

The station was at first devoted only to mango storage, but the work has been extended to the Punjab Malta orange, to the banana and to seed potatoes. There are still many problems in connection with these that remain to be solved, for example, problems connected with respiration, pre-cooling and chilling of fruits. The work is such that it requires several years for dealing with all details. In addition, other fruits such as pineapple, grapes, figs and also vegetables ought to be studied. This is the only low temperature research station in India and it serves already several provinces and States the authorities of which have thoroughly realized its usefulness, and it is likely that in future the work done will be of still greater importance. For example we are only now (at the suggestion of the Imperial Council of Agricultural Research itself) beginning to take up the problem of gas storage of fruits—a means of storage which offers great possibilities of longer life and better quality of stored fruit.

The Cold Storage Research Station is well situated and has been very efficiently run up to date under the guidance of an expert horticulturist with oreign experience and with a high-class technical staff in charge both of the research and the machinery. I would like to bring to the notice of the Imperial Council of Agricultural Research that the Secretary of State for the Colonies has informed the Governing Body of the Tropical College of Agriculture at Trinidad that the Colonial Development Advisory Committee has recommended a capital grant to cover the cost of extending the present low temperature research station there and effecting necessary repairs and alterations, and a further free grant to meet the recurring expenditure of the station for the period 1st October 1936, to 30th September 1941. This indicates the importance which the Colonial Office attach to the Cold Storage Research in that area. India cannot afford to be behind and the continuation of the Cold Storage Research Station at Kirkee and the extension of its work is a logical necessity. I have, therefore, every confidence in requesting that the Imperial Council of Agricultural Research will consider favourably this application for an extension of the scheme for another 3 years. The details of the expenditure are given below :—

Pay of Establishment.	1937-38.	1938-39.	1939-40.
	Rs.	Rs.	Rs.
1. Research Assistants	4,961	5,141	5,245
2. Laboratory Assistants	960	1,036	1,080
3. Servants	1,428	1,428	1,428
4. Mechanical staff	3,120	3,365	3,528
5. Leave salary for the above	215	215	215
Total	10,684	11,185	11,496
Travelling allowance and Honoraria	1,000	1,000	1,000

Contingencies.	1937-38.	1938-39.	1939-40.
1. Office expenses and miscellaneous (*a*)	851	741	741
2. Service postage and telegrams	50	50	50
3. Upkeep and running of machinery (*b*)	3,380	3,380	3,380
4. Purchase of fruits (*c*)	100	100	100
5. Apparatus and chemicals	300	300	300
Total ..	4,681	4,571	4,571
GRAND TOTAL ..	16,365	16,756	17,067
	Rs. 50,188.		

(*a*) It is proposed to shift the present telephone connection to the bungalow of the Horticulturist. It is found that most visitors who wish to see the Cold Storage Research Station, visit the place before or after office hours and in some cases it has not been possible for the Horticulturist to be informed of the arrival of such visitors.

A sum of Rs. 100 for the purchase of a bicycle has been included. This matter was discussed at the time of the visit of Sir Bryce Burt in October 1935.

(*b*) The experience during the last cold storage season has shown that the running charges during the period of six months are about Rs. 100 per month. An extra sum of Rs. 600 is proposed.

(*c*) A sum of Rs. 100 is proposed for the purchase of fruits which are required for experiments other than the cold storage work. The provision of funds for storage trials is not necessary, as the provinces are to bear expenses on that account.

COLD STORAGE RESEARCH SCHEME.

Programme of Research Work for the three years, 1937-38, 1938-39 and 1939-40.

1937-38—

(1) Study of the effects of pre-cooling.

(2) Observations on the effect of bruising on the rotting of the mango.

(3) Study of the economics of cold storage.

(4) Continuation of the cold storage trials of Malta and Nagpur oranges.

(5) Continuation of the experiments on preservation of seed potatoes by cold storage.

(6) Cold storage trials of different varieties of banana.

1938-39—

(1) Respiration studies of mango.

(2) Studies on the chilling of mango at low temperatures.

(3) Experiments on freezing of ripe mango at 10° F.

(4) Studies on the relation of the time of picking of fruit in a season to its keeping quality.

(5) Cold storage trials of papayas, grapes and other fruits.

(6) Continuation of the cold storage trials of Malta orange.

1939-40—

(1) Study of the behaviour of fruit of one variety of mango obtained from different orchards (representing different cultural treatments) in a locality.

(2) Cold storage trials of pineapples, figs, tomatoes and other fruits received from the Provinces.

A detailed programme of research work will be submitted every year to the Imperial Council of Agricultural Research for their approval before the beginning of each year.

APPENDIX XXI-A.

Supplementary Note by the Secretary, Imperial Council of Agricultural Research, dated the 8th July 1936, on Subject No. 31 (a) :—Application for the extension of the Bombay Cold Storage Research Scheme, for a period of three years with effect from 1st March 1937, at a total cost of Rs. 50,188.

The attached letter from the Government of Bombay, No. 4369-A.|28, dated the 2nd July 1936 (Annexure), is circulated to the Advisory Board in continuation of the Note, dated 25th June 1936 (Appendix XXI).

ANNEXURE.

COPY OF LETTER NO. 4369-A.|28, DATED THE 2ND JULY 1936, FROM THE UNDER SECRETARY TO THE GOVERNMENT OF BOMBAY, REVENUE DEPARTMENT, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

SUBJECT :—*Cold Storage Research Scheme. Extension of period of* ——.

I am directed by the Government of Bombay (Transferred Departments) to invite a reference to your letter, No. 2945-Agri., dated 13th December 1932, in which the Research Council sanctioned a grant of Rs. 90,154, spread over a period of three years on the conditions mentioned therein. The programme of experimental work was subsequently expanded so as to enable other Provincial Governments and Indian States to take advantage of the experiments carried out under the scheme. The scheme was started from 1st March 1934, and will terminate on 28th February 1937. I am now to forward an application from the Director of Agriculture for the extension of the scheme for a further period of three years from 1st March 1937, at a total cost of Rs. 50,188. The reasons for the extension of the period of the scheme have been fully explained by the Director of Agriculture. The Government of Bombay strongly support them and trust that the Imperial Council of Agricultural Research will accept the proposals. I am to add that the contribution of the Local Government towards the cost of the scheme will be confined to the supervision of the Horticulturist over the scheme and provision of facilities for conducting the investigations at the Ganeshkhind Fruit Experimental Station as at present.

APPENDIX XXI-B.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 27th June 1936, on Subject No. 31 (b) :—Application from the Government of Bombay for a grant of Rs. 11,019 spread over three years for a Scheme of Gas Storage of Fruits and Vegetables.

In February 1936, the Advisory Board, after considering the *interim* report of the Cold Storage Station, recommended *inter alia* that the Director of Agriculture, Bombay, be asked to collect information on the question of developing gas storage of fruit in India and to place it before the next meeting of the Advisory Board with a small scheme for investigating this subject*. The Director of Agriculture has accordingly submitted the attached scheme (Annexure) which involves expenditure of Rs. 11,019 (including a non-recurring expenditure of Rs. 5,739) spread over a period of three years. The scheme will first be considered by the Fruits Sub-Committee whose report will be submitted to the Board in due course (Appendix XIX).

ANNEXURE.

A Scheme for the Gas Storage of Fruit.

The Cold Storage Research Scheme as at present subsidized by the Imperial Council of Agricultural Research started working from March 1934, and during the last two years has achieved results of some economic importance, especially in the case of the Alphonso mango. It was at the start suggested that gas storage might be taken up side by side with the other investigations but the suggestion was omitted presumably due to financial stringency. Recently the Fruit Committee of the Imperial Council of Agricultural Research at their meeting on 11th February 1935, suggested that the gas storage of fruit in India should be taken up and that the Director of Agriculture, Bombay, be asked to collect information on this subject and to place it before the next meeting of the Advisory Board with a small scheme for investigating this subject.

Gas storage has attracted a good deal of attention during recent years. Amongst the Empire workers the chief investigators on this problem are Drs. Kidd and West. The details of their investigations are given in their publications (1, 3 and 4). They claim that a suitable mixture of carbon dioxide, oxygen and nitrogen can keep fruits in good condition for a longer period than low temperature alone. Investigations on these lines are proposed for India. The mango will be the principal fruit used in this scheme but it may be possible to undertake also work on the Nagpur orange, the Malta orange, the banana and any other important fruit, with the co-operation of other provinces.

The following problems will be investigated :—

I. What is the optimum percentage of carbon dioxide in the storage atmosphere and the best composition of gas mixtures for the longest commercial storage life of the fruit ?

II. What is the optimum temperature for gas storage in an atmosphere with the best gas composition ?

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*Vide pages 28, and 240 of the printed proceedings A. B., February, 36 Meeting.

III. What is the proper stage of maturity of fruit intended for gas storage ?

As regards problem I, a series of gas mixtures containing varying percentages of carbon dioxide will be used for the trials. A gas mixture containing 10 per cent carbon dioxide, 10 per cent oxygen and the rest nitrogen will be taken as a standard mixture and other mixtures of varying compositions will be prepared. As regards the stage of maturity (problem III) of fruit, the same procedure as adopted in the cold storage investigations will be followed.

As regards problem II, the different temperatures available at the Cold Storage Research Scheme will be employed. Temperatures of 35°F, 40°F, 45°F, 48°F, 52°F, 56°F and 68°F will be investigated. This assumes that the present cold storage research scheme is extended. A proposal for the extension of Cold Storage Research Scheme is separately submitted.

Most of the work can be handled by the present establishment of the Cold Storage Research Scheme. But the work of analysing and preparing different gaseous mixtures will be considerable and the services of an extra research assistant will be necessary.

Apparatus.

Initial expenditure for the following equipment will be necessary :—

1. Gas cabinets.
2. Gas receptacles.
3. Gas flow meters and other laboratory apparatus.

Recurring expenditure will be required for the gases and the fruits required for the experiments.

It is necessary to point out at this stage that gas storage investigation is highly technical. To carry out this work successfully a thorough knowledge of its technique is essential and therefore it is suggested that Dr. Karmarkar (Senior Research Assistant of the existing scheme) may be given an opportunity to study this subject thoroughly at the Low Temperature Research Station, Cambridge for a period of 2 months (excluding time taken in travelling). The cost of his training is included in the statement of expenditure. It will not be necessary to have any substitute in his place.

STATEMENT OF EXPENDITURE.

	Rs.	Rs.
Non-recurring :—		
6 Gas cabinets	2,000	
Gas receptacles	500	
Gas flow meters and laboratory apparatus ..	1,500	
	4,000	4,000
1. Passage from Kirkee to Cambridge—		
(*a*) Kirkee to Bombay II class	7 7 0	
(*b*) Bombay to London by P. & O. line II class B grade—£42, at current rate of exchange ..	560 0 0	
(*c*) London to Cambridge III class —£ 0-7-2 ..	4 12 0	
Total	572 3 0	

	Rs.			Rs.
And back	572	3	0	
Total in round figure	1,145	0	0	
2. Voyage and Railway journey allowance—				
(*a*) *13 days of voyage from Bombay to* Marscilles @ 5 Shilling per day—£ 3-5-0	43	5	0	
(*b*) One day of railway journey @ 20 shilling per day—£ 1-0-0	13	5	(	
Total	56	10	0	
And back	56	10	0	
Total in round figure	114	0	0	
3. Stoppage allowance—				
60 days at Cambridge at 12 shilling per day—£ 36-0-0	480	0	0	
Total	1,739	0	0	1,739
Grand Total ..				5,739

Recurring :—(Per annum)—

	Rs.	Rs.
Pay of one Junior Research Assistant at Rs. 60 p.m.	720	1,720
Cost of different gases	500	
Purchase of fruits for experiments	500	

Period of the scheme.

The scheme may be sanctioned for a period of three years, *i.e.*, for the same period as has been applied for in the case of the Cold Storage Research Scheme and as an addition to it. The work will, however, be undertaken after the programme of work already in hand for the current year is carried out.

The total cost of the gas storage investigations will be as follows :—

	Rs.
Non-recurring	5,739
Recurring for three years	5,280*
	11,019

A short note on gas storage of fruit and vegetables is appended herewith, for information.

*This includes an increment of Rs. 10 p. m. in the third year for the Junior Research Assistant.

GAS STORAGE OF FRUIT AND VEGETABLES.

The problem of storing produce for a period between the time it leaves the hand of the producer and the time it reaches the consumer occupies to-day a pivotal position in the general economy of the world's food supplies. The fact is well illustrated in the case of fresh fruit and vegetables. The great developments which the last half century has witnessed have largely depended upon progress in the efficiency of storage and transport. The changes that make for increased efficiency depend directly or indirectly on our ability to preserve perishable food. (1) Preservation in fresh condition by means of artificial cold has developed rapidly during this century and now developments are taking place in an allied method of preservation known as gas storage where the atmosphere of the storage chambers contains a suitable mixture of different gases. The most important gas employed being carbon dioxide.

2. Carbon dioxide, as one of the end of products of respiration in plants, might be expected upon accumulation to exert an inhibiting influence on the respiration of plant tissues. In fact this has been the prevailing conception of the problem since the time of De Saussure's "Recherches Chimiques Sur La Vegetation" published in 1804. Many researches carried out to test experimentally the influence of carbon dioxide upon the respiration of plants have almost invariably shown retarding influence (2).

3. The Food Investigation Board broke new ground (3) by demonstrating the remarkable effects which could be obtained by controlling the carbon dioxide and oxygen content of the atmosphere. The storage life of certain varieties of English apples, particularly the Bramley's Seedling, could be prolonged and ripening retarded. The effect was due to the accumulation of carbon dioxide which retarded the rate of respiration thus slowing down the ripening processes of the fruit. With the above variety of apple the authors found that the best results were obtained with about 10 per cent oxygen and 11 per cent carbon dioxide in the storage atmosphere. The optimum temperature appeared to be in the region of 40°F for this variety of apple. At this temperature, gas storage was found to double the storage life of the fruit, as compared with storage in air at the same temperature. The carbon dioxide also seemed to have specific effect upon the fruit in practically stopping the change in ground colour from green to yellow.

4. The new Research Station at East Malling, the Ditton Laboratory, is provided with equipment specially designed for a more extensive study of gas storage and its various applications. Further experiments (4) on gas storage have shown that it has the advantage that (1) larvæ are killed and (2) higher temperatures are permissible than in air storage, so that low temperature breakdown can be avoided. The optimum concentration of Co_2 was found to be different for different varieties. Gas storage is complicated by accumulation of volatile oils from the fruit.

5. Preliminary experiments on gas storage of mango (Rasapuri variety) were done by Banerjee, Karmarkar and Rao, (5) who stored the fruits in glass jars containing 5, 10, 15 and 20 per cent carbon dioxide. They found that the time required for the ripening of fruits stored in atmospheres containing 15 and 20 per cent carbon dioxide was about 12 days at room temperature. They did not develop the normal red or

orange colour of Rasapuri variety, but were pale yellow. The fruits were, however, of sweet taste and good flavour. Cheema and others, (6) found that fruits exposed to carbon dioxide in the respiration experiments kept in firm condition at low temperatures without any appreciable pitting or oozing observed in fruits not so exposed.

Gussow (4) tried 'Mackentosh' variety of Canadian apple and found that in 70 per cent carbon dioxide at 40°F the fruit of this variety stood better than the fruit of any other variety.

(1) Food Investigation Board, Special Report, No. 30 (Gas Storage of Fruit).

(2) Carbon dioxide storage, III. The influence of carbon dioxide on the Oxygen uptake by fruits and vegetables by N. C. Thornton. Contributions from Boyce Thompson Institute, Vol. 5, 1933, pages 371—402.

(3) A survey of the principal storage and transport problem of the Empire to-day, by Franklin Kidd. Proceedings of the Fruit Imperial Horticultural Conference. Part III Progress of Fruit Storage Method, 1931, pages 3—9.

(4) Summary Report on problems of fruit storage and Transport. (Imperial Botanical Conference, London, 1935, by E. K. Janki Ammal, J. B. Hutchinson.)

(5) Investigations on the Storage of Mangoes, by B. N. Banerjee, D. V. Karmarkar and G. R. Rao, Agriculture and Live-Stock in India. Vol. IV, Part 1934, pages 36—53.

(6) The Cold Storage Research Scheme, Report on the Investigations relating to the Cold Storage of Mango Fruit during the season of 1934.

GAS STORAGE RESEARCH SCHEME.

Programme of Research Work for the three years, 1937-38, 1938-39 and 1939-40.

1937-38—

Problem I of the Gas Storage Research Scheme for fruits.

What is the optimum percentage of carbon dioxide in the storage atmosphere and the best composition of gas mixtures for the longest commercial storage life of the fruit ?

1938-39—

Problem II of the Gas Storage Research Scheme for fruits.

What is the optimum temperature for gas storage in an atmosphere with the best gas composition ?

1939-40—

Problem III of the Gas Storage Research Scheme for fruits.

What is the proper stage of maturity of fruit intended for gas storage ?

A detailed programme of research work will be submitted every year to the Imperial Council of Agricultural Research for their approval before the beginning of each year.

APPENDIX XXI-C.

Supplementary Note by the Secretary, Imperial Council of Agricultural Research, dated the 8th July 1936, on Subject No. 31 (b) :—Application from the Government of Bombay for a grant of Rs. 11,019 spread over three years for a Scheme of Gas Storage of Fruits and Vegetables.

In continuation of the Note, dated the 27th June 1936, already circulated to the Advisory Board (Appendix XXI-B), the following extract from a letter from the Government of Bombay, No. 4369-A.|28, dated the 2nd July 1936, is circulated for information of the Advisory Board :

" The Government of Bombay strongly recommend the scheme for the favourable consideration of the Imperial Council of Agricultural Research. The provincial contribution towards the cost of the scheme will be limited to the supervision to be exercised by the Horticulturist over the scheme and the provision of facilities for work, to be done under it at the Ganeshkhind Fruit Experimental Station ".

APPENDIX XXI-D.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 10th July 1936, on Subject No. 31 (c) :—Application for the extension of the Scheme for Experiments on the Preservation of Fruits and Vegetables in the Punjab, at a total cost of Rs. 12,970 spread over two years, with effect from the 9th November 1936.

In January 1932, the Advisory Board recommended for sanction the scheme for experiments on the preservation of fruits and vegetables in the Punjab, at a cost not exceeding Rs. 11,070 (including a non-recurring grant of Rs. 1,500) spread over a period of two years (*vide* pages 26 and 357—359 of printed proceedings). The scheme was actually started with effect from the 8th November 1934, and will terminate on the 8th November 1936. The first progress report on the work done under the scheme is being placed before the Advisory Board separately [*vide* subject No. 23 (*v*) of the Agenda].

2. The proposed extension of the scheme (Annexure) involves a total expenditure of Rs. 12,970 (including non-recurring expenditure of Rs. 500 for miscellaneous apparatus) spread over a period of two years. It has been strongly recommended by the Government of the Punjab. The extension scheme will first be considered by the Fruits Sub-Committee along with the first progress report on the scheme, referred to above and the report (Appendix XIX) will be submitted to the Board in due course.

ANNEXURE.

LETTER FROM THE OFFG. DIRECTOR OF AGRICULTURE, PUNJAB, TO THE JOINT SECRETARY TO GOVERNMENT, PUNJAB, DEVELOPMENT DEPARTMENT, NO. 190-C., DATED THE 2ND|3RD JULY 1936.

With reference to Punjab Government endorsement No. 342(-D., dated the 19th November 1934, I have the honour to say that the Imperial Council of Agricultural Research was requested to finance the scheme for experiments on the preservation of fruits and vegetables in the Punjab, for a period of 3 years but the Council sanctioned it for a period of two years only *in the first instance* at a cost not exceeding Rs. 11,070 (non-recurring Rs. 1,500 and recurring Rs. 9,570), *vide* Punjab Government endorsement No. 608-D., dated the 9th March 1933. The work was started on the 8th November 1934.

2. During the last few years the importance and necessity of carrying out research on the preservation of fruits and vegetables has been greatly felt and the results obtained by the experiments made at the Punjab Agricultural College, Lyallpur, under this scheme have shown vast possibilities for this industry in this province. The present term of the scheme is due to expire on the 8th November 1936 and as the work undertaken under this scheme would not at all be concluded by November next it is necessary that the scheme should be extended for a further period of 2 years with a view not only to confirm the results already

obtained but also to carry on work on some of the products which have not been attended to so far. A brief progress report on the work already done is enclosed.

3. Pending a review of the work done by the Imperial Council of Agricultural Research by two Experts from England early in the next cold weather, the Council has asked (*vide* Punjab Government endorsement No. 1079-D., dated the 31st March 1936) that the submission of new schemes should be held over till the meeting of the Advisory Board in the summer of 1937. In view, however, of the circumstances explained in paragraph 2 above and due to the fact that the scheme under reference is not a new one it is requested that the Council may be asked to consider the extension of the scheme as a special case for a further period of two years at an estimated cost of Rs. 12,970 (non-recurring Rs. 500 and recurring Rs. 12,470), *vide* details attached.

4. The items of expenditure are more or less the same as provided for in the original scheme with the exception that a junior Research Assistant in the grade of Rs. 100—10—200|10—300 less 15 per cent., *i.e.*, with a start of Rs. 85 per mensem *plus* Rs. 10 per mensem increment in the next year has been added. The experience of the past two years has shown that to do full justice to the work on this scheme the services of a qualified man to assist the Research Assistant are needed. The Research Assistant on most occasions found his hands too full and had to give up certain pieces of important work for want of the requisite assistance. With the additional expenditure of about Rs. 1,000 a year the outturn of work will greatly increase.

The Research Assistant at present employed on the scheme is in receipt of Rs. 250 per mensem in his substantive post as Agricultural Assistant in the grade of Rs. 100—10—300. If the extension of the scheme is sanctioned as proposed he will draw Rs. 250 per mensem from 8th November 1936, Rs. 260 per mensem from 3rd January 1937 and Rs. 270 per mensem from 3rd January 1938, as against Rs. 250 per mensem, provided for him in the original scheme.

5. The progress report on the work done under this scheme is to be considered by the Advisory Board of the Imperial Council of Agricultural Research in its meeting to be held at Simla from the 13th to the 18th July 1936, and I shall be grateful if the Council is approached at a very early date to consider this application simultaneously with the progress report on the scheme. It has not been considered necessary to obtain the views of the Punjab Council of Research on this proposal as the scheme is not a new one.

6. As the time is short, a copy of this letter is being sent to the Secretary, Imperial Council of Agricultural Research, for advance information.

No. 191-C.

Copy forwarded to the Secretary, Imperial Council of Agricultural Research for information with reference to the correspondence ending with this office letter No. 151|67-309-II, dated the 11th April 1935.

Statement showing expenditure in connection with the proposal of extension of the scheme for experiments on the preservation of fruits and vegetables in the Punjab for a further period of 2 years.

	Rs.
1st year (8th November 1936 to 7th November 1937).	
Non-recurring—	
Miscellaneous Apparatus	500
Recurring—	
One Senior Research Assistant @ Rs. 240 p. m. up to 2nd January 1937, and Rs. 260 from 3rd January 1937	3,110
One Junior Research Assistant on 100—10—300 less 15% @ Rs. 85 p. m.	1,020
One Laboratory Attendant at Rs. 30 per mensem	360
Contingencies such as fruits, sugar, jars, labour, etc.	1,000
Travelling Allowance	500
Total ..	5,990
2nd year (8th November 1937 to 7th November 1938).	
Recurring—	
One Senior Research Assistant @ Rs. 260 p. m. up to 2nd January 1938 and Rs. 270 p. m. from 3rd January 1938	3,230
One Junior Research Assistant @ Rs. 95 p. m.	1,140
One Laboratory Attendant at Rs. 30 per mensem	360
Contingencies such as fruits, sugar, jars, labour, etc.	1,000
Travelling Allowance	750
Total ..	6,480
GRAND TOTAL ..	12,970

Non-recurring Rs. 500

Recurring Rs. 12,470 spread over a period of 2 years.

APPENDIX XXII.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 25th June 1936, on Subject No. 17 :—Progress Reports for 1935-36 on Animal Nutrition Schemes, Dacca and Coimbatore.

The Progress Reports noted below will be considered by the Animal Nutrition Committee and its report (Appendix XXIII) will be circulated to the Advisory Board in the usual course :—

1. Annual Report for 1935-36 of the scheme for the study of animal nutrition problems in Bengal.
2. Summary of work done under the scheme of animal nutrition work at Coimbatore during 1935-36.

APPENDIX XXIII.

Proceedings of the Meeting of the Animal Nutrition Committee appointed by the Imperial Council of Agricultural Research held at 'Rock House', Simla, at 10-30 A.M. on Tuesday, the 14th July 1936.

The following were present :—

1. Colonel A. OLVER, *Chairman.*
2. Col. H. C. DIBBEN.
3. Dr. J. K. DUBEY.
4. Mr. T. J. EGAN.
5. Mr. E. S. FARBROTHER.
6. Mr. P. J. KERR.
7. Mr. ZAL R. KOTHAVALLA.
8. Mr. T. F. QUIRKE.
9. Mr. P. V. RAMIAH.
10. Dr. K. C. SEN.
11. Dr. BURCH H. SCHNEIDER.
12. Rao Bahadur B. VISWANATH.
13. Mr. F. WARE.
14. Mr. A. C. AGGARWALA (*Secretary*).

Visitors :

1. S. DATAR SINGH.
2. Mr. S. M. A. SHAH.

Annual Report for 1935-36 of the scheme for the study of animal nutrition problems in Bengal (Subject No. 17 of the Agenda). (Appendix XXII).

Dr. Sen remarked that the report was particularly valuable in regard to the new method for the estimation of digestibilities on a statistical basis which had been worked out. He drew attention to Dr. Warth's remarks in Appendix I—*viz.*, "I think it is one of the very best bits of work that has been carried out on digestion not merely in India but anywhere". He however suggested that as it was proposed to adopt it in this country copies of the Report should be sent to Dr. Fisher and to Cambridge, and Aberdeen to ascertain how far the statistical basis of the method were correct. Rao Bahadur Viswanath considered this unnecessary and after discussion it was agreed that such a reference was hardly needed in view of the fact that the method had now been published and would be criticised by other workers. What was most needed was practical application of it in research institutes in this country on a wide scale to determine its practical applicability. The Chairman observed that this scheme had led to valuable results and that its extension had already been recommended.

Summary of work done under the scheme of animal nutrition work at Coimbatore during 1935-36 [Subject No. 17 (2) of the Agenda]. (Appendix XXII.)

As work had only started in April there was not much to report but the technical programme of this scheme was discussed at length as it appeared to be too extensive for the available staff and facilities. Moreover as an enlarged nutrition Institute was now being provided it would be more appropriate if fundamental work on such matters as metabolism and vitamin assays were left to that Institute to carry out. After dealing with it item by item, the Committee agreed that the programme was too big and a sub-committee consisting of the Chairman, Rao Bahadur Viswanath, Mr. Ramiah, Dr. K. C. Sen and Dr. Burch H. Schneider was formed to go into the matter and report. This Sub-Committee met at 2-30 P.M. and recommended that the following items should be omitted, *viz.*,

Item 2 (*c*) and (*d*) ;

Item 3 ;

Item 4 (*a*), (*b*), (*c*) and (*d*) ;

Item 5.

APPENDIX XXIV.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 15th June 1936, on subject No. 25 :—Application from the Government of Madras for a grant of Rs. 92,487 spread over three years for a scheme of research for improving the fishing industry and developing the supply of fish manure.

Attention is invited to the attached letter (Annexure I) from the Government of Madras, No. 3563-II|33-I, dated the 11th January 1933, forwarding the scheme noted above. The scheme was first considered by the Fertilisers' Committee at its meeting held in February 1934. The Committee decided to recommend the scheme on account of the high feeding and manurial value of fish meal and fish manure, subject to the condition that the Madras Government revived the measures previously adopted for the development of deep-sea fishing. The Advisory Board at its meeting held in September 1934, accepted the recommendation of the Committee and decided that the condition laid down by the Committee should be attached to any grant that might be made to this scheme. The scheme was placed before the Governing Body at its meeting held in January 1935, which decided to postpone the scheme till full facts on the continuance of the survey of deep sea fishing resources were received from the Madras Government.

2. The Government of Madras were addressed in the matter and their reply (Annexure II) was considered by the Advisory Board at its meeting held in February 1936. The Board did not consider that the request of the Governing Body regarding the continuance of deep-sea fishing experiments had been complied with and were of the opinion that the scheme should be dropped.

3. A communication (Annexure III) has now been received from the Madras Government intimating that they will conduct deep-sea fishing experiments with a Yorkshire Coble for a period of 3 years from 1st July 1936. In the altered circumstances the scheme is again submitted for consideration by the Advisory Board. It will first be considered by an *ad hoc* committee on the 15th July 1936. The points which specially require the attention of the committee are the following :—

(1) Whether there is any need to get a technical chemist from abroad and whether a competent Indian Bio-Chemist would not do equally well ?

(2) Whether it is at all necessary to depute an Indian chemist to United States of America at a cost of Rs. 20,000 to study the technique ?

(3) Whether a provision of Rs. 11,500 for apparatus, etc., is required ?

(4) Whether the investigation should be taken up by the Imperial Council of Agricultural Research in view of the industrial bias of the investigation ?

(5) In the event of the Imperial Council of Agricultural Research financing the scheme, what should be the appropriate contribution which should be made by the Madras Government ?

The report of the committee (Appendix XXV) will be submitted to the Advisory Board in the usual course.

ANNEXURE I.

LETTER FROM S. H. SLATER, ESQ., C.M.G., C.I.E., I.C.S., SECRETARY TO THE GOVERNMENT OF MADRAS, DEVELOPMENT DEPARTMENT, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, NEW DELHI, No. 3563-II|33-I., DATED FORT ST. GEORGE, THE 11TH JANUARY 1933.

Fish manure Research.

I am directed to forward a scheme of research for improving the fishing industry and developing the supply of fish manure for favourable consideration by the Imperial Council of Agricultural Research.

As the Council is aware, the Department of Fisheries in Madras has been engaged for some time in introducing improvements in the manufacture of fish guano, fish meal and fish manure. Prior to the investigations made by the department, the method of producing fish fertilizer was primitive in character and consisted in drying sardines in the sun on the sands of the open beach. This system had two drawbacks. Large quantities of valuable oil of no manurial value were lost and the manure became so highly impregnated with sand that analysis frequently showed the resultant mass to contain as much as 40 per cent of this useless adulterant. Experiments were, therefore, undertaken at the Tanur station on the West Coast and had a speedy success. It was found that a simple and inexpensive plant could be devised to separate the oil and fertilizer effectively and profitably and the oil and the fertilizer so separated were of such good quality and fetched such high prices that numerous private factories came into existence on the Malabar and South Kanara coasts. Further experiments have shown that it is likely that a good proportion of the fish guano now used as a fertilizer will eventually be used more profitably as food for live-stock, cattle pigs, dogs, poultry, etc. Success has already been obtained in producing fish meal on a small scale from all the common fish found on the West Coast. Samples of these were exhibited at the Wembly Exhibition and several enquiries followed for the supply of the meal in bulk. The conversion of 'scrap' (fish pressed for oil) into fish meal is more remunerative to the manufacturers and useful to the agriculturist than conversion into fish guano.

The processes now followed at Tanur for separating the oil and the fertilizer are, however, still empirical and crude. Much remains to be done by technological research to improve the quality of the oil and to develop the manufacture of guano and fish meal on approved scientific lines. The process of boiling and expressing the oil by hand presses which is now done at the Research station and in private factories is wasteful inasmuch as the proteins and other nitrogenous substances from the fish are lost in liquid form. The mechanical devices for manufacture of these products on a commercial scale have still to be improved so that production may be cheapened and quality standardized. Every step in the manufacture of oil and guano requires careful and detailed investigation and experiment. The degree of freshness of the fish required for high class manure and meal. the correct temperature for cooking, methods of cooking in closed or open vessels by steam or open fire, the period for which

cooking should be continued, method of separation of oil without detriment to the quality or manure, the degree of dryage of scrap, etc.—all require detailed investigation and accurate experiment. Though general methods of manufacture are the same everywhere details of the process differ with each kind of fish. The process suitable for Indian fish have, therefore, to be specially ascertained before the fish guano industry can claim to have attained even a reasonable degree of success. The perfection of the methods of manufacture, of fish meal referred to above, which is a more remunerative industry and one of considerable importance to the agriculturist in feeding live-stock requires also the services of an expert Fisheries Chemist and Technologist.

The Tanur station as at present equipped and staffed is not competent to deal with any of the problems enumerated above. The Director of Fisheries proposes, therefore, that a bio-chemical laboratory should be established at Tanur and the services of a competent and experienced Bio-Chemist should be engaged for a period of at least three years to begin with. As the research is of a highly technical nature, the officer to be recruited should be a technologist of wide experience and it is not anticipated that such an officer could be obtained for less than Rs. 1,200 per mensem. One of the Assistants of the United States Bureau of Fisheries with considerable experience in the manufacture of oil and guano who has actually patented improved processes and machinery, was interviewed by the Director in 1929 when he agreed to come to India for a short term of years but considered that a salary of Rs. 1,200 per mensem was the minimum which he could accept. It is understood that this officer, though he has since left the Bureau, will be available to undertake the proposed research at Tanur.

It will be convenient and economical to locate the laboratory at Tanur where there is ample accommodation for the Technologist, his staff and his laboratory. It is considered that if the experiments prove as is expected, a success, the laboratory will be required as a permanent measure and it will then be necessary to have a suitable Indian specially trained in charge of the work. To that end, it has been suggested that a Chemistry Honours Graduate of an Indian University of approved merit and high academic qualifications should be recruited at once on an initial salary of Rs. 200 a month. In order to enable him to acquaint himself with local conditions and specific problems relating to Indian fish oil and manure industry he will be deputed for a period of one year to visit the private oil and guano factories on the coast and to work under the immediate control and guidance of the expert at the Tanur station. After a preliminary study and training he should be deputed to America. for an advance course of bio-chemistry with special reference to fish oil, guano, and fish meal manufacture for a period of one year. The deputation to America is proposed as it undoubtedly offers the best facility for study and training to Indian students. In America, the student will visit the Atlantic and Pacific coasts, where two different kinds of fish are used in the industry. On his return at the end of the second year he will resume his work under the expert, the intention being that he should eventually succeed the expert. During the one year when the student will be away on training the expert will need the assistance of a suitable well-trained assistant of the department. An assistant on Rs. 70—250 will therefore be attached to the expert during the second year of the recruit's training abroad.

The total cost of the scheme is as shown below :—

Non-recurring.

		Rs.
Apparatus, chemicals, etc., for the laboratory	..	10,000
Furniture and fittings	..	1,500
Site, buildings, plants, laboratory and office	..	39,120
Total	..	50,620

Recurring.

		Rs.
Pay of Bio-Chemist at Rs. 1,200 a month	..	43,200
Pay of Research Assistant at Rs. 150 (one year)	..	1,800
Pay of laboratory assistant on Rs. 65—125	..	2,484
Pay of clerk on Rs. 35—60	..	1,278
Pay of peon on Rs. 12—18	..	432
Contingencies	..	3,000
Apparatus and chemicals	..	3,000
Travelling allowance	..	3,000
Passage of the expert	..	3,500
Total		61,694

To the above expenditure will be added the cost of training of an Indian candidate as shown below :—

		Rs.
Pay at Rs. 200 (for 12 months) ..	..	2,400
Travelling allowance in India ..	..	1,000
Charges on account of the candidate going to America for a period of one year at 2,000 dollars	..	8,500
Pay for the third year on return at Rs. 230	..	2,760
Passage to and from America (£160) ..	..	2,133
Travelling allowance in America ..	..	2,500
Total	..	**19,293**

The scheme as explained above was placed before the Provincial Research Committee and has been approved by it. The contribution of Madras Government towards the cost of the scheme will be the cost of buildings, site, etc., estimated at Rs. 39,120 and included under non-recurring expenditure shown above. The continuance of the Tanur station has at present been sanctioned only up to 31st March 1934, and even if they decide to discontinue the work now done there after this date they would have no objection to allow the use of the buildings, laboratory, etc., for the conduct of the proposed investigation. The scheme is of importance not only to Madras but to all India. The Government of Madras attach great importance to the development of fish manure industry and I am to express the confident hope of His Excellency the Governor acting with his Ministers that the scheme will receive the sympathetic consideration of the Imperial Council of Agricultural Research.

ANNEXURE II.

LETTER FROM THE SECRETARY TO THE GOVERNMENT OF MADRAS, DEVELOPMENT DEPARTMENT, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, No. 1150-II|35-2, DATED THE 17TH SEPTEMBER 1935.

With reference to your letter No. F. 67|34|Vet., dated 13th March 1935 (not printed), I am directed to state that, under the scheme placed before the Imperial Council of Agricultural Research by the Government of Madras, it was proposed to conduct research in order to evolve improved methods of manufacturing fish oil, fish meal and fish manure. On account of the high feeding and manurial value of fish meal and fish manure, the Fertilizers Committee of the Council recommended the scheme, subject to the condition that the Madras Government would revive the measures previously adopted for the development of deep-sea fishing. But the Governing Body of the Council deferred consideration of the scheme until full information about the continuance of the survey of deep-sea fishery resources was received from the Government of Madras.

2. A short account of the action taken by the Madras Government to develop deep-sea fishing will be found in the letter from the Director of Fisheries, a copy of which is enclosed. It will be observed that the Government purchased and employed a trawler to make a survey of deep-sea fishing grounds. The results of the survey have been recorded in bulletins, of which two have been published and copies of them are enclosed ; the third is in the Press. Unfortunately, however, the trawler soon became unserviceable and had to be sold. Expenditure on further research of this nature was obviously useless unless the discoveries already made could be exploited to an appreciable extent. The Director of Fisheries, therefore, proposes to employ a Yorkshire Coble, which was obtained in connection with the previous deep-sea fishing experiments, to demonstrate the possibility of exploiting the fishing grounds discovered by the trawler. His proposal is under consideration.

3. But, even without any intensive exploitation of deep-sea fisheries or any further investigation of them, there is, on an average, a sufficient surplus, over and above local food requirements, of certain classes of cheap shoaling fish suitable for conversion into fish guano and manure. The

manufacture of fish oil is, admittedly, chiefly conditioned by the presence of the Sardine in sufficient quantities. The causes of the periodical absence of this fish from the inshore waters of the West Coast are a constant subject of study. The Government of Madras, therefore, fail to understand why their proposal to employ a bio-chemist for research into improved methods of manufacturing fish meal, fish oil and fish manure should depend on a revival of the measures previously adopted for the investigation of the possibilities of deep-sea fishing.

4. In the circumstances, the Government of Madras would urge a favourable consideration of their proposal.

FROM THE DIRECTOR OF FISHERIES, MADRAS, REF. No. 2804-E.|31, DATED THE 9TH AUGUST 1935.

Ref. Government Memorandum No. 1150-II|35-1, dated 28th March 1935.

The Governing Body of the Imperial Council of Agricultural Research asks for full facts regarding the continuance of the survey of deep-sea fisheries before they sanction the scheme for research on fish manure at Tanur. From the Proceedings of the Governing Body it is clear that the Council are not aware of the contribution the Madras Government has made towards the development of deep-sea fisheries for the last two decades and more. A short account of the deep-sea fishing investigations conducted in Madras since 1909 seems necessary for a correct appreciation of the present position and future policy of the Madras Government with regard to the development of marine fisheries.

Development of deep-sea fisheries.

For the last three decades, ever since the inception of the Department of Fisheries, the development of deep-sea fishing has been the main aim of the Government and considerable money, time and effort have been expended on it. The investigations made fall under two heads :—

(1) Trials with various types of fishing boats, rig and gear ; and

(2) Scientific survey of deep-sea fisheries and fishing banks.

(1) *Trials with various types of fishing boats, rig and gear.*—In 1909 two fishing boats one a sailing vessel of 12 tons " Sutherland " designed by the Fishery Board of Scotland, and the other a 15 h. p. motor vessel " Turbinella " of 25 tons of Arklow design were constructed at a cost of Rs. 6,000 and Rs. 8,000 respectively. Fishing experiments beyond the usual range of the local boats were conducted with these boats till 1910-11. The experiments show that these boats were too big for small work but not big enough for large work. The " Sutherland ", though it caught a larger quantity of fish than local vessels was found too slow for the light winds of the East coast. The motor boat " Turbinella " attracted the attention of the fishermen at Tuticorin by the unusual catching power of her nets. The main difficulty encountered was the impossibility of obtaining a crew, who, on their own initiative and without expert supervision would work and modify their methods as occasion required in unknown and hitherto untried conditions and purely experimental work.

In addition two of the largest fishing boats of local type (Ratnagiri sailing drifters) of 6 to 8 tons were chartered from the Kanara coast and

drift net experiments beyond the usual range of local fishermen were conducted. They brought in large quantities of fish—1,500 lbs. in weight for one night's work was the largest catch. Each of the two boats caught on an average at the rate of 10 tons for the two months. The catches however could not be landed fresh. A motor boat as carrier was therefore considered essential.

Proposals for the recruitment of a Master Fisherman from Scotland were next sanctioned by Government but the Great War prevented the recruitment.

Pending the recruitment of a Master Fisherman and experiment with western methods, two Ratnagiri boats were purchased in 1915-16 (Cost Rs. 2,000) as they could not be chartered, for continuing the experiments *with local Malabar crews. Trial* fishing with these boats was done from 1916-22, when the experiments were finally abandoned for the reason (as in the case of " Sutherland " peviously) that the crew did not work satisfactorily in the absence of expert guidance and in addition the boats could not land fresh fish without a motor carrier.

Mr. Hornell next recommended experiments with a Danish motor cutter and seine net in 1920-21. Instead of a cutter a powerful sea-going motor launch " Sea Scout " of 30 h. p. was purchased in 1922 on the advice of the Indian Stores Department at a cost of Rs. 37,000 and an Experienced Master Fisherman was also recruited to conduct experiments. The vessel however proved totally unsuitable in design and equipment and the experiments ceased in March 1924. The expenditure incurred on the experiment, apart from the cost of the launch, was Rs. 12,072.

(2) *Survey of deep-sea fisheries and fishing banks.*—In 1908 Mr. Hornell conducted a preliminary trawling cruise off the Malabar coast with the pearl fishery inspection vessel, a steam boat " Margaritta " purchased at a cost of about Rs. 90,000. His conclusions were (1) that steam trawling would not be remunerative within the 30 fathom line where the bottom consists of mud, but a zone roughly 25 miles of grey sand beyond this line which extends from Cochin to Coondapoor may prove profitable ; (2) the " Margaritta " was too small and feeble a boat and otherwise quite unsuitable for experimental trawling and inspection and a survey with a larger better equipped boat was necessary. A new inspection schooner replacing the " Margaritta " was then built at a cost of Rs. 99,731 at Calcutta in 1913. She, however, did not prove a sea-worthy boat for trawling and deep-sea work, though suitable enough for the inspection of pearl banks and chank fisheries in the sheltered waters of the Gulf of Manaar.

In 1914 the Government examined the need for a larger vessel. A Committee consisting of Sir F. A. Nicholson, Mr. Hornell and Commander Huddleston met in conference at Coonoor and recommended the construction of a steam trawler at a cost of £85,000. As War had commenced, Government decided to postpone the proposal till after the War.

The scheme was revived in 1919 and another Committee was appointed to examine the question. The Committee recommended a larger trawler costing £30,000, among other purposes, for (1) a survey of trawling grounds from inshore to the 100 fathom line ; and (2) a general off-shore fishing investigation other than trawling, *i.e.*, the extension of fishing operations into off-shore waters for shoaling and surface fish. As the Naval architects estimated the cost of this trawler at the prohibitive sum of £109,000, the proposal had to be abandoned in 1920.

In 1924 the fish-curing yards of the Presidency were transferred to this Department. The main item of expenditure on yards was the purchase and transport of salt from Tuticorin to the West coast yards at a cost approximately of Rs. 2 lakhs per annum. Combining the three duties, salt transport (done till then by hired schooners), the survey of deep-sea fishing grounds, and the inspection of the Laccadives, it was found that a second-hand trawler at a cost of £2,000 (the market price in 1924) could be purchased and worked by the Government economically. Accordingly in 1926 a trawler 'Lady Goschen' was obtained at a cost of Rs. 75,986 and the services of Capt. Cribb as Master Fisherman were entertained. For the first time a systematic survey of deep-sea grounds, on two selected sections of the East and West Coasts, was conducted from 1927 to 1931 at a total cost of Rs. 5,63,427. The results are embodied in three reports, two of which have been published so far (copies enclosed). The survey had to be suspended in 1931 on account of the unfortunate breakdown of the trawler's boiler and the urgent need for retrenchment on account of the unprecedented economic depression.

Though the survey was confined to two selected sections of the coast it has resulted in some remarkable discoveries of fishery resources wholly unsuspected before. Besides regularly recording the kinds and abundance of the common food fish in off-shore waters and their seasons the following five new fisheries, all of which were previously unknown, were located :—

(1) An extensive shark ground opposite Point Calimere.

(2) A squat-nosed lobster fishery from Point Calimere to Cuddalore and beyond.

(3) A perch fishing ground from Point Calimere to Pondicherry.

(4) Horse Mackerel fisheries from Pondicherry to Madras.

(5) A large cuttle fish fishery off Coondapoor in South Kanara.

An even more remarkable fact brought out by survey was the striking contrast between the off-shore fisheries of the section of the East and West coast surveyed. The off-shore fisheries of the East coast were found to be far superior in quality and value to those on the West coast. The existence of such a wealth of good class fish on the East coast had never been suspected before.

The earlier experiments in the survey of fishing grounds indicated the need for a larger boat of the trawler type. The survey by the trawler 'Lady Goschen' has now shown beyond doubt the existence of valuable fisheries in the off-shore waters on sections of the East and West coasts explored by her. For studying deep-sea conditions and the habits of fish, especially the richness or otherwise in fish generally of our deeper waters of which nothing was known before, and to indicate probable developments in capturing methods, an expensive trawler with its equipment and staff were indispensable. While the trawler was a necessity to enable the Department to make the researches upon which future marine fishery developments may be founded, it was never contemplated that the Indian fishing industry would jump from the catamaran or canoe to the steam trawler all at once. The task, therefore, of ascertaining a suitable type of small but efficient modern power boat which would enable the fishermen to exploit the off-shore fisheries that may be discovered by the survey had engaged the attention of the Department from the start.

The experience gained with various types and sizes of sail, motor and steam fishing boats from 1909 has been valuable but in itself did not finally solve the problem. The most serious handicap, besides the heavy capital investment, to the introduction of large-sized modern craft and methods of sea-fishing is the absence of harbour facilities and shelter for sea-going boats. The existing fishing craft (canoes and catamarans) are beached when not in use or in stormy weather. Even if men and money are available for the development of fishing, the absence of shelter in the form of natural or artificial harbours in most places precludes the introduction of larger sail or power boats.

The heavy surf is another, perhaps, minor handicap for fishing craft and any modern boat which is not specially designed to withstand the heavy surf is not suited to the fishermen's requirements. What was needed was a cheap power boat built on approved modern lines, more roomy and better constructed than the existing canoe or catamaran and capable of cruising longer distances than either, but one which, at the same time could be beached securely like them and could be launched against a heavy surf. After an extensive study of sea-going fishing craft in other countries, and in consultation with Fishery experts, the introduction of the Yorkshire Coble, which closely resembles the "Sampan" of Japan and China, and happily combines all the requisite qualities, was decided on as the most likely immediate improvement possible in Indian sea-going fishing craft. The remarkable feature of the coble is that the Yorkshire and Durham fishermen have embodied in her fifty years before the time the main principles of design reached after much experimenting in the modern speed motor-boat—the high hollow bow running away to the clean flat sections of the stern. No wonder that the coble has attained such a reputation for speed, especially when reaching with a good weight of wind.

The coble is one of the most distinctive types of craft to be found in Europe or Asia. She was primarily designed for launcing off beaches against heavy seas and admirably has she met this principal requirement. With a high-shouldered bow and a deep grip, she carries a flat floor aft to her low stern, beneath which two "skorvels" or shallow bilge keels, help to keep her upright and to launch her down the beach. Besides, the twin keels help to shield the propeller from coming into contact with the ground when the boat is beached or launched. The deep forefoot is useful in coming head first off the shore into a breaking sea, being a help in keeping the head of the boat up to windward, drawing as it does from two or three feet. It gives her a powerful grip which added to the hold given by the deep rudder enables a coble to be a very fine performer on a wind, especially in a sea-way. The coble will enable the fisherman to cruise much longer distances with the certainty of expeditious return to his home port. The boat being beachable, this innovation need not await the development of fishing harbours.

Accordingly a 23 feet square stern motor 'coble' equipped with 6-8 h. p. engine was ordered from Mr. W. H. Cambridge (a well known coble builder) at a cost of Rs. 2,920 and arrived in India on 29th November 1930. As her arrival almost coincided with the breakdown of the trawler's boiler and the termination of Cap. Cribb's services no experiments have been possible with the boat.

As the worst of the depression appears to have been tided over, proposals to recruit an experienced Yorkshire Coble Fisherman to experiment with the coble and demonstrate its fishing possibilities on the fishing grounds discovered by the trawler, are under consideration.

Circumstances entirely beyond the control of the Madras Government led to the termination of the survey and there seems to be no immediate prospect of resuming the survey largely due to financial stringency. There is also the fact that the extensive off-shore fisheries discovered by the trawler have not yet been exploited, by the local fishing industry. Under the present financial stringency, the question of giving practical advice and assistance to fishermen to extend their operations beyond present limits to the off-shore grounds surveyed by the trawler was naturally considered more important than continuing the survey itself. The proposed experiments with the coble, it is hoped, will make this possible. The Madras Government have so far spent a sum of Rs. 7,21,419 as per details below, towards the development of deep-sea fisheries.

Name of vessel.	Capital cost.	Year.
	Rs.	
1. Margaritta	90,000	1908
Running expenses not available.		
2. Sutherland	6,000	1909-11
Running expenses not available.		
3. Turbinella	8,000	1910-11
Running expenses not available.		
4. Ratnagiri Machuwas	2,000	1916
Running expenses not available.		
5. Sea Scout	37,000	1922
Running expenses	12,072	
6. Trawler 'Lady Goschen'	75,986	1926-31
Running expenses	4,87,441	
7. Yorkshire coble	2,920	1930
No experiment has been conducted yet with the boat	7,21,419*	

*Excludes Rs. 99,731 being the cost of 'Lady Nicholson' built in 1913 as she is suitable only for the inspection of pearl banks and chank fisheries and the working expenses of the vessel (1) to (4) for which separate figures are not now available.

The keen interest of the Madras Government in developing the deep-sea fishing industry in the Presidency will be evident from the brief history given above of the continuous experiments conducted so far and the large investment involved. Proposals to recruit a Yorkshire Coble Fisherman to demonstrate the use of the coble, the motor-boat, decided on as the most suitable for conditions in India are now receiving attention.

The oil sardine occurs in sufficient abundance along the West Coast of India upto Baluchistan and beyond and also in the Andamans and Mergui Archipelago, Burma and beyond, but the industry has been

scientifically developed only in the two west coast districts of Malabar and South Kanara through the far-sighted initiative of the Madras Government. The research on manure proposed in Madras will, therefore, benefit not only Madras but all the other provinces concerned. The research can be carried out only in Madras as facilities for the work exist here and the Tanur station has been engaged in the work for over two decades.

The Council seems to be also under the misapprehension that without a large supply of fish, which could be made available only through the development of deep-sea fishing, there would be no scope for the development of the manure industry on the lines described in the scheme. Fairly accurate statistics of annual production and value are available only for the two districts of the Madras Presidency where the industry exists in an organised form. The statement below furnishes the figures for the twelve years ending 1933-34.

Year.	Fish guano.		Fish manure.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	Rs.	Tons.	Rs.
1922-23	32,000	24,00,000	..	..
1923-24	22,500	13,50,000	17,000	6,80,000
1924-25	4,000	4,25,000	1,000	1,00,000
1925-26	9,850	7,50,000	1,000	70,000
1926-27	2,100	2,52,000	2,100	2,10,000
1927-28	850	95,000	10,000	10,00,000
1928-29	1,100	1,10,000	15,000	7,50,000
1929-30	223	24,530	730	73,000
1930-31	65	4,550	110	4,000
1931-32	71	5,325	840	50,400
1932-33	20	2,400	18	1,800
1933-34	10,000	2,50,000	13,600	3,26,400
Total	82,779	56,68,805	61,398	32,65,600

Fish guano plus Fish manure	Quantity		1,44,177 tons.
	value.	Rs.	89,34,405.
Average per year	Quantity		12,015 tons.
	value.	Rs.	7,44,534.

In my letter Ref. 2804-E.|32 to Government, dated 15th October, 1933, statistics of the value and output of the West coast industry for 10 years ending 1931-32 were given. The average annual value for the 10 years, of fish guano and manure amounted to about 8½ lakhs. Statistics for the 12 years ending 1933-34 now available (see statement) show that the average annual value of the industry has decreased to Rs. 7½ lakhs. That this is not due to any decrease in the quantity of fish converted into

manure is evident from the average annual quantity of manure produced during the 12 years. While the quantity has remained more or less stationary, the average annual value has deteriorated by a lakh of rupees due to the prevailing economic depression and depreciation of the market value of commodities. If the cost of oil is added, the value of the industry is about half a crore of rupees in a good year and about 10 lakhs every year on an average for the two districts mentioned ; this, in spite of the several unfavourable seasons, undeveloped state of the guano industry (only crude products are manufactured) and the limited extent of the sea coast (Malabar and South Kanara). There is on an average, therefore, a sufficient surplus of certain classes of cheap shoaling fish above local food requirements for conversion into manure even without the intensive exploitation of deep-sea fisheries. The average aggregate value of the industry amounts to the high figure of 10 lakhs over a limited coastline of 250 miles in Madras and is bound to be very much more if the entire West coast including Baluchistan, and Assam, Burma, the Andamans and the Mergui Archipelago in the East are taken into account. The oil and guano industry is, therefore, carried on from year to year and is of sufficient magnitude to justify the small expenditure of Rs. 30,829 per year on research, for a period of three years for improving and modernising the methods of production.

ANNEXURE III.

LETTER FROM C. A. HENDERSON, ESQ., I.C.S., SECRETARY TO THE GOVERNMENT OF MADRAS, DEVELOPMENT DEPARTMENT, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, NEW DELHI, No. 2578-II|35-10, DATED FORT ST. GEORGE, THE 15TH APRIL 1936.

In continuation of my letter No. 2578-II|35-4, dated 17th December 1935 (not printed), I am directed to state that the Government of Madras have since passed orders approving the proposal of the Director of Fisheries to conduct deep-sea fishing experiments with a Yorkshire Coble, and sanctioning the employment of a Yorkshire Master Fisherman on a pay of Rs. 400 per mensem and a staff of a driver and lascar on Rs. 30 and Rs. 17 per mensem respectively for a period of three years from 1st July 1936.

APPENDIX XXV.

Proceedings of the Meeting of the Madras Fish Scheme Committee appointed by the Imperial Council of Agricultural Research, held at the Legislative Assembly Building, Simla, at 3 p.m., on Wednesday, the 15th July 1936.

The following were present :—

1. Sir BRYCE BURT (*Chairman*).
2. Rao Bahadur B. ANANDA RAO.
3. Mr. N. BRODIE.
4. Mr. E. J. BRUEN.
5. Mr. H. L. DUTT.
6. Mr. A. M. LIVINGSTONE.
7. Mr. K. McLEAN.
8. Col. A. OLVER.
9. Mr. K. P. PILLAI.
10. Mr. C. B. SAMUEL.
11. Dr. B. SUNDRA RAJ.
12. Rao Bahadur B. VISWANATH.
13. Mr. A. C. AGGARWALA (*Secretary*).

After Dr. Sundra Raj had introduced the scheme the discussion mainly centred on whether it was worth while to get a foreign Bio-Chemist. Mr. Brodie doubted if a really first class technologist to deal satisfactorily with the problem of improving the Madras Fish Industry could be induced to come to India on the salary suggested in the scheme. After discussion the Chairman suggested that the best way to tackle the problem was to recruit, through the Public Service Commission, a highly qualified Indian chemist with proved research capacity and experience in oil technology. He should be in Class I scale with initial salary of Rs. 500 and after 6 months' training and experience of local conditions in India he should be sent abroad (especially Germany) for training. This was agreed to. It was agreed also that he might return to India, *via* America and Japan so as to get some insight into the work in those countries. It was agreed that in order that advantage could be taken of the services of the chemist after his return, the duration of the scheme should be extended to 4 years in all.

The scheme was then recast as shown in the attached statement. It was estimated that as revised the cost would be about Rs. 50,000 and it was agreed that of this the Madras Government should contribute one-third in addition to making provision for a suitable chemical laboratory ; the remaining two-thirds of the cost to be met by the Imperial Council of Agricultural Research.

The meeting adjourned at 4-30 P.M.

B. C. BURT.

SIMLA :
The 15th July 1936.

Statement showing cost of the revised scheme.

	Rs.
Pay of the scholar while in India for 6 months @ Rs. 500 per mensem.	3,000
His travelling allowance in India	1,000
Passage and pay while under training abroad for 1½ years (lump sum).	13,000
Pay in Class I for 2 years	13,500
Pay of Research Assistant at Rs. 150 per mensem for 2 years.	3,600
Pay of Laboratory Bearer at Rs. 20 per mensem for 2½ years.	600
Travelling allowance after training abroad ..	2,000
Apparatus, chemicals, etc.	10,000
Contingencies	3,000
Total ..	49,700

APPENDIX XXVI.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 18th June 1936, on subject No. 16 :—Report of the Tractor Ploughing Work conducted by the Burmah-Shell Company, during 1935.

In February 1935, the Advisory Board considered the Burmah-Shell Company's report on the tractor ploughing work, carried out during 1933-34 (pages 15 and 116-17 of the printed proceedings). The Company has now submitted a further report which is supplementary to their previous reports (Annexure I). The report of the Department of Agriculture, Bombay, regarding re-growth of *hariali* weed in certain of the tractor-ploughed lands, referred to in the "Introductory" as well as the Burmah-Shell Company's comments thereon are also enclosed (Annexure II).

The Vice-Chairman considers that it will be an advantage to have these reports considered in detail by the following Committee :—

1. The Vice-Chairman, Imperial Council of Agricultural Research, *Chairman, ex-officio.*
2. The Agricultural Expert, Imperial Council of Agricultural Research.

3—9. The Directors of Agriculture, Madras, Bombay, United Provinces, Punjab, Central Provinces, Bihar and Baroda.

10. Mr. W. J. Jenkins, Chief Agricultural Officer, Sind.
11. Mr. C. P. G. Wade of the Burmah-Shell Company.

Secretary, Imperial Council of Agricultural Research, *Secretary, ex-officio.*

This Committee will meet at 3-00 P.M. on Wednesday, the 15th July 1936 and its report (Appendix XXVII) will be submitted to the Advisory Board in due course.

ANNEXURE I.

FURTHER REPORT ON TRACTOR PLOUGHING WORK SUBMITTED BY BURMAH-SHELL OIL STORAGE AND DISTRIBUTING COMPANY OF INDIA, LIMITED.

Introductory.

This report is supplementary to the reports for the combined seasons 1930, 1931, 1932, 1933, and 1934 on the tractor ploughing work carried out by Burmah-Shell Oil Storage and Distributing Company of India, Limited and submitted to the Advisory Board of the Imperial Council of Agricultural Research from time to time. This is also a report on further practical work carried out on a commercial scale during 1933-34 and 1934-35 by the Karnatak Agricultural and Transport Company in the Bombay Presidency.

Supplementary to this report will also be found a report from the Director of Agriculture, Bombay Presidency, regarding the re-growth of *hariali* weed in certain of the lands tractor ploughed by Burmah-Shell during the seasons mentioned above. The object of this report is to bring up to date, as far as is possible, the information and data relating to the use of tractors for cultivation in India and also to enable some opinion to be

arrived at, regarding the value of the work done between 1930 and 1934 in connection with experimental work for the eradication of deep-seated weeds, which is dealt with further in this report.

The results of the experimental work carried out from 1930 to 1934 are contained in Scientific Monograph No. 9 issued by the Imperial Council of Agricultural Research entitled ' Mechanical Cultivation in India ' and this report should be considered as supplementary to the Scientific Monograph mentioned above.

Burmah-Shell discontinued their practical experimental work at the close of the 1933-34 season when the Imperial Council of Agricultural Research made a grant of Rs. 7,000 towards the cost of the experiments which the Advisory Board considered should be continued in order to determine more accurately the working life of tractor and to carry out further experimental work in connection with plough shares. Of the grant of Rs. 7,000 approximately Rs. 5,750 only, were spent and the balance has been returned to the Imperial Council of Agricultural Research.

Life of Tractor and Basis of Depreciation.

A fair basis of depreciation of tractors is a subject on which widely divergent views are expressed and in 1932 varying opinions were expressed at the *ad hoc* Tractor Committee appointed by the Advisory Board of the Council ranging from 1,000 to 6,000 hours. This Committee laid down that as a general rule it can be said that when the spare-part expenditure is equal to the initial cost of the tractor, then the tractor is no longer economical for work. One of the two tractors worked in 1933-34—Caterpillar 30 H. P. Kerosene tractor—ploughed for 4,000 hours at the end of the season and its maximum drawbar pull under test was 93.5 per cent of the manufacturers' original claim or the maximum drawbar pull of the new tractor, and it is claimed that a minimum economic working life of 8,000 hours could, therefore, be safely assumed. This figure which it is hoped will be again considered by the *ad hoc* Tractor Committee and the Advisory Board for confirmation, has received further confirmation from the results obtained during the past few months and there is no doubt that with the constantly improving design of tractors and with a consequent strengthening in parts and cheapness of production the life of a tractor will become longer and longer. The two TD-40 McCormick-Deering being worked by Mr. Fletcher have both worked over 2,000 hours and are in perfect condition and Mr. Fletcher considers a life of at least 10,000 hours can be expected from these tractors.

Practical work in Phaltan State.

Messrs. Karnatak Agricultural and Transport Company carried out a considerable amount of tractor cultivation work in Phaltan State during 1934 and a McCormick-Deering T. D. 40 Diesel Tractor and Rud Sack Tillage implements were used, and also a Fowler Gyrotiller. The specification of these two tractors is given in an Appendix to this report. Both these units were engaged on cultivation and other work on lands owned by the Phaltan Sugar Company, and the cost given later are worked out in exactly the same way as the cost figures given in connection with Burmah-Shell work in Scientific Monograph No. 9.

The McCormick-Deering outfit worked for a 24-hour day while the Fowler outfit was worked only during the day, *i.e.* for 12 hours. A time recorder was used on the McCormick-Deering Tractor outfit and the discs have been retained with the Daily Report Forms for inspection by anyone interested. In the case of the Fowler outfit the working time was noted by the Engineer in charge. The use of time recorders is of great value to all those engaged in tractor work and one should be fitted wherever possible to every tractor, as this will enable owners and Managers to see at a glance exactly what periods the tractor was working and will bring to light any slackness or negligence on the part of the tractor drivers. The McCormick outfit was only able to plough, whereas the Fowler outfit ploughed, harrowed, and ridged all in one operation. Of the area ploughed by the McCormick Deering about 30 per cent. had to be harrowed before ridging operations could be carried out. The McCormick-Deering was worked from 9″ to 14″ and the Fowler from 9″ to 12″. Deeper work was not possible due to underground stones throughout the area. During the period over which the results given below were obtained the Fowler outfit working costs are very high due to stoppage for repairs rains, and stony conditions, and better results could certainly be obtained under good soil conditions with large fields and adequate supply of spare parts and dry-weather conditions.

Hariali was found in most of the land ploughed but it is too early to make any observations regarding the removal of this weed with the Rotary Tiller and the Mouldboard Plough, but it is justifiable to state that the use of Mouldboard ploughs appear to leave the ground more open than in the case of the Rotary Tiller and that better results could be obtained with Rotary Tiller in lands infested with *hariali* if ridging was not carried out at the time of ploughing. It will be remembered that one of the results from Burmah-Shell experimental work was the conclusion that the Mouldboard Plough is the most suitable for grass eradication since the soil is inverted and the grass is left on the surface, so that it cannot take root again having been killed by the sun.

It was found that the Rotary Tiller and the Mouldboard Plough both brought up a great deal of sub-soil and in the case of the latter the manufacturers are sending to India a new type of plough-share and mouldboard with cut away sections, which will enable the top six inches to be inverted and the lower soils only to be broken up. In the case of the Rotary Tiller the angle of the tillers can be changed to overcome this trouble. The following statement worked over a period of 21 days shows how the time was spent for the two units in question :—

How time used.	Fowler Unit.			McCormick.		
Maximum possible time	Hours. 252	Minutes. 00	Percentage. 100	Hours. 504	Minutes. 00	Percentage. 100
Ploughing Time ..	65	30	26	291	15	58
Repairs time	82	30	25	29	45	6
Transport time ..	13	00	5	7	20	1½
Rains Time	91	00	36	135	30	27
Oil and Greasing ..	20	00	8	24	30	5
No Area	..			14	25	2½

In studying the above statement it must be noted that 25 per cent of the maximum working time for the Fowler outfit was lost due to repairs and a great deal of time was lost due to rains, which has resulted in the cost per acre being far higher than it otherwise would have been, as the overhead expenses staff and interest on capital have to be accounted for in any case.

The following shows the working costs for the two units :—

Description.	Fowler.	McCormick.	Remarks.
	Rs. a. p.	Rs. a. p.	
Kerosene Oil	..	11 0 0	Used for camp.
Engine Oil	70 0 0	77 0 0	
Track Oils	35 0 0	45 12 0	
Fuel Oil	134 0 0	176 8 0	
Petrol	..	6 15 0	Starting.
Waste	1 4 0	1 4 0	
Tractor Spares		124 6 0	* See foot note.
Plough spares	150 0 0	182 4 0	† See foot note.
Local spares	5 0 0	6 12 0	‡ See foot note.
Drivers and Assistants ..	106 0 0	122 0 0	
Supervison	34 0 0	68 0 0	
Postage		17 0 3	§ See foot note.
Depreciation	911 10 0	494 6 0	
Interest	367 8 0	76 2 0	
Total costs ..	1,814 6 0	1,409 5 3	
Output	51½ Acres.	161 Acres.	
Cost per acre	35 3 0	8 13 0	

NOTES.

* *Notes. Tractor Spares for Fowler*—They were made at the factory workshops and the costs have not been worked out.

† *Plough Spares*—In both cases this is high due to the very stony conditions under which both units were operating.

‡ *Local Spares*—This refers to Nuts, Bolts, etc. purchased in the local market.

§ *Postage &c.*—The Fowler's account has not been made out yet.

Transport.—In the case of the McCormick-Deering unit a sum of Rs. 141 has been spent on transport, but as the Fowler accounts for transport have not been worked out this has also been left out in the McCormick costing statement.

In studying this statement it must be remembered what has already been mentioned that the Fowler outfit ploughed, harrowed and ridged in one operation whereas the McCormick only ploughed, so the cost of the Fowler truck represents the cost of three operations.

Tractor work in Dharwar District during 1934-35 season.

Messrs. the Karnatak Agricultural and Transport Company carried out a considerable amount of contract tractor ploughing in Dharwar District, Savanur State, and Bellary District (Madras Presidency). Two T. D.-40 McCormick-Deering Diesel Trac-tractors were employed and Rud Sack Deep tillage Mouldboard ploughs. The following is a cost statement for the work carried out in 1934-35, worked out on exactly the same basis as the costs given above and during Burmah-Shell work :—

Description.	Total costs.	Cost per acre.	Cost per hour.
	Rs. a. p.	Rs. a. p.	Rs. a. p.
A. Drivers salary	2,104 15 0	0 15 0	0 8 9·9
B. Petrol	63 4 0	0 0 5·5	0 0 3·1
C. Engine Oil	1,670 8 0	0 11 11·1	0 7 0
D. Fuel Oil	2,285 5 0	1 0 3·8	0 9 9·2
E. Trans. Oil	105 0 0	0 0 9·5	0 0 5·3
F. Track Compound	681 0 0	0 5 1·2	0 2 5·9
* { G. Tractor Spares	2,523 0 0	1 2 1·2	0 10 7·2
* { H. Plough Spares	1,604 15 0	0 11 5·6	0 6 10·1
I. Spares Local	478 15 6	0 3 4·9	0 2 0
J. Kesosene Oil	12 8 0	0 0 1·5	0 0 0·6
Total Direct Charges ..	11,529 6 6	5 2 8·3	3 0 3·3
† M. Depreciation	8,302 0 0	3 10 8·1	2 2 11·7

* Inclusive of Rs. 800 for experimental purposes.

† Inclusive of depreciation on lorry and tank equipment.

Depreciation for all the above cost figures was worked out on the basis of 8,000 working hours.

The cost per acre for the 2 McCormick-Deering Tractors, *viz.*, Rs. 8|13|0 and Rs. 8|13|4 compare very favourably with the results obtained during the 1934 experimental work with Kerosene and Diesel tractors.

The following shows the cost per acre of some of the tractors employed from 1931 to 1933 by Burmah-Shell. It will be noted that the cost of the Kerosene tractors is higher than the cost of Diesel tractors :—

Tractor.	Place and Season.	Depth.	Cost per acre.
		Inches.	Rs. a. p.
McCormick-Deering 15/30 (Kerosene) ..	Dharwar 1931-33	12	9 2 6
Ditto	Raichur 1931-32	10	11 10 0
McCormick-Deering 22/36 (Kerosene) ..	Dharwar 1933 ..	10	11 0 11
Caterpillar 30 (Kerosene)	Dharwar 1931-32	10	13 1 2
Lanz (Dessel)—			
No. 1	Raichur 1933 ..	10	11 5 4
No. 2	Raichur 1931-33	10	9 14 3
No. 3	Do. ..	10	9 11 3
No. 4	Do. ..	10	9 9 1
No. 5	Do. ..	10	11 11 4
No. 6	Do. ..	10	10 13 4

Practical work by Hanomag Tractors.

The following information has been supplied by Messrs. Pashabhai Patel & Co., Baroda, agents for Hanomag Diesel Tractors.

These figures have been supplied by the owners of tractors and have not been obtained under the same strict statistical conditions as those given for the work above referred to.

There are six Hanomag Diesel tractors belonging to Maharashtra Sugar Mills, Ltd., Belapur Road. They work from 18 to 20 hours a day for ten months in the year. Two of these tractors have already accounted for 10,000 working hours and all of them are still working. The Engineer-in-charge of this fleet has reported to us that with a 4 furrow plough this tractor will plough 5 to 6 acres in 10 hours to a depth of 10 to 12 inches in black sugarcane soil and he estimates that the life of the tractors can be safely taken at 10,000 to 15,000 hours. The above figures are confirmed in a letter from Mr. G. B. Kulkarni, at present Farm Manager of Messrs. Kesar Sugar Works, Ltd., Bareilly, U. P., formerly in charge of the tractors belonging to Messrs. Maharashtra Sugar Mills, Ltd., Belapur Road. Mr. Kulkarni confirms the information given by the Engineer-in-charge and he estimates the life of these tractors at 10,000 hours.

These statements and figures are given as some guide in the consideration of the life of modern tractors but it must be emphasised that the statistical side of the work is not given the same amount of strict attention as the work carried out by Messrs. Katco, Ltd.

Trend of Tractor and Implements Design.—The following is an extract from a report received from Mr. A. Rowlinson, representative for India of the International Harvester Export Company, who manufacture and market through their agents Messrs. Volkart Bros. the McCormick-Deering tractor.

"As far as the International Harvester Company is concerned, a great many improvements in the design of agricultural implements has taken place during the past few years. The 22/36 H. P. Tractor is no longer in production as our Model F. 30 Farmall Tractor has taken its place, and in addition to our Model F. 20 Farmall, which has been in use now for many years, my Company has introduced the small F. 12 Farmall Tractor for use on small farms and also to do the lighter jobs on large farms where the employment of a large tractor would not be economical. The three sizes of Farmall Tractors have machines specially designed for them and these machines cannot be used with any other type or make of tractor.

We find that on the sugar cane Estates here in India Farmall tractors are in great demand fitted with ridging ploughs for making the furrows in which the cane sets are planted and then for earthing up the cane even after it has attained a height of 3′ to 4′. The high axle clearance of the Farmall Tractors and the peculiar spacing of the wheels permits the Farmalls to operate in rows of standing crops. The Farmall Tractors, therefore, cannot only do the same work as the older Models but they are more versatile and are able by their design to displace oxen in both intercultivation of row crops and for ridging up.

Since your report was published the International Harvester Company has also placed on the market two types of Diesel tractors, each having a motor of approximately 56 H. P. One of these is a tractractor or crawler type and the other is a wheeled type, each type being useful in its own particular sphere, for ordinary agricultural purposes on dry soil the wheeled tractor is all that is necessary while the initial cost and maintenance charges are considerably less than that of the tractractor.

This latter machine, however, is particularly useful for breaking up heavy unbroken virgin soil where a very high drawbar-pull is needed and where soil-conditions do not permit of the use of a tractor having wheels.

The International Harvester Company have also introduced new types of ploughs but these are designed more for light or average soil-conditions and not for working heavy black soil or eradicating *hariali* or *kans* grass, where ploughing has to be a depth of 9″ to 10″. Extremely heavy ploughs suitable for deep work are manufactured by other concerns and these ploughs are available from Volkart Brothers to work in conjunction with our largest tractors, when necessary".

Case Heavy Duty Disc Plough.—Mr. L. L. Lingle, representative in India for Messrs. J. I. Case Company, reports that his Company is now importing into India a new heavy duty disc plough which has been thoroughly

tried out in India and found suitable for the extreme conditions under which it has to work in India. Mr. Lingle advises that "these ploughs are of very heavy and strong construction, specially designed for rough usage. They are equipped with ball bearings for the discs, specially sealed against dirt, and represent the very latest engineering developments in plough designs. Since they will plough from 4″ to 14″ deep, they are general-purpose ploughs suitable for practically all types of soils and conditions."

Rud Sack Deep Cultivation Plough.—Type $CV_{14}N$. This is generally admitted as one of the most suitable types of ploughs for work in connection with weed eradication and for work involving deep ploughing. It will be noted that this type of plough is being used with success by Messrs. Katco, Ltd. The plough is specially made for work in the hardest soils and the body is reinforced by an upright steel bar. Bodies and shares of various types can be fixed and for black cotton soil the share ME with downward pointing beak has been found most suitable while in quartzy soil a chisel type share with reversible chisel is recommended. The chief characteristics of this plough are its extreme strength, light draught due to the small cutting width, good clearance for the passage of the soil and the reasonable price.

The plough is manufactured as a 4 bottom plough but it can be worked either with 3 or 5 bottoms. It will plough up to 16″ in the hardest of soils and the cutting width is as follows :—

3 Bottoms	33 inches.
4 Bottoms	44 inches.
5 Bottoms	55 inches.

C. P. G. WADE,
for Burmah-Shell,
Oil Storage and Distributing Co. of India, Ltd.

APPENDIX.

Specifications.

The International Harvester Diesel TD—40 Trac Trac Tor Tread—60 inches. Weight 12,500 pounds.

Capacity—Maximum capacity at sea leavel barometric reading at 60°F. temperature.

Belt horsepower, maximum	**50·73**
Drawbar horsepower, maximum (third speed)	**44·68**
Drawbar pull in pounds (maximum)	
First	**9340**
Second	**7740**
Third	**6180**
Fourth	**5170**
Fifth	**3890**

Speeds in miles per hour, computed at full load engine speed of 1100 r. p. m.

First	1·74
Second	2·19
Third	2·74
Fourth	3·18
Fifth	3·98
Reverse	2·19

Engine—Four-cycle, circulating pump cooled :—

Number of cylinders	4
Bore in inches	4·3/4
Stroke in inches	6·1/2
Revolutions per minute	1100
Piston speed in feet per minute	1191·67
Displacement, cubic inches per minute	506,810
S. A. E. horsepower rating for tax purposes	36·1
Lubrication—crankshaft, connecting rods, camshaft and valve rocker arms	Full Presssure.

Crankshaft—

Number of main bearings	5
Diameter, main bearings in inches	3·1/4
Total area main bearings, surface, sq. in.	102·5

Engine clutch diameter (single plate) inches	14
Fuel Gravity	24°B.

Track Dimensions—

Tread—centre to centre of track, inches	47·3/4
Length of tracks (ground contact) inches	70
Track shoe width, inches	16
Height of grouser	2·1/8
Number of track rollers, bottom	5
Number of track rollers, upper	2
Area of ground contact, sq. in. (with Standard tracks)	2240

Tractor Dimensions—

Length overall, inches	140
Width overall, inches	63·3/4
Height, base of shoe to top of air cleaner, inches	82·3/8

Minimum Ground Clearance (from base of shoe), inches (at equalising spring)	11·3/4
Height—Drawbar above ground, low position	11
Lateral Movement of Drawbar, inches	21·3/8

Steering Clutches (double-disc type)—

Speed—Revolutions per minute in fifth speed	1600
Diameter (double), inches	10

Steering Brakes—Diameter, inches 9

Power Take-Off Shaft (splined S. A. E.)

Speed, r. p. m.	535
Diameter, inches	1·5/8

Transmission—Five speeds, selective gear mounted entirely on ball bearings.

Final Drive (mounted on ball bearings)—

Speed reduction ratio in 5th Speed	22·74 to 1

Capacities—(*U. S. Standard gallons and quarts*)—

Cooling system—gallons	15
Fuel tank—gallons	41
Gasolene (petrol) tank, for starting only—glns	1·1/4
Engine lubrication—quarts	12

Shipping Weights—

Approximate net weight	11,715 lb. (5314 kg.)
Approximate shipping weight (boxed for export)	12,950 lb. (5874 kg.)
Cubic feet (for export, not boxed)	292
Cubic feet (boxed for export)	364

Fowler 80 H. P. Diesel Rotary Plough " Gyrotiller".

Continuous B. H. P. of Engine	170 (@ 900 r. p. m.)
Fuel Tank Capacity	100 gallons.
Auxiliary Fuel Tank Capacity	80 gallons.
Four Travelling Speeds forward	0·7, 1·0, 1·37 and 1·95 miles per hour.
Two Reverse speeds	0·6 and 1·5 m. p. h.

Two Speeds for the Rotary Tillers.

Two Rings of Rotary Tillers, for tilling 16" to 18" deep.

6-cylinder Heavy Duty Type 4-cycle Diesel Engine, with enclosed governor, suitable for burning fuels up to a specific gravity of ·88. Arrangements can be made for using heavier fuels if required.

Protectomotor. Type Air Cleaners.

Centralised control levers for the operator.

ANNEXURE II.

COPY OF LETTER No. 5, DATED THE 16TH MAY 1936, FROM THE DEPUTY DIRECOR OF AGRICULTURE, S. D., DHARWAR, TO THE DIRECTOR OF AGRICULTURE, BOMBAY PRESIDENCY, POONA, REGARDING REGROWTH OF *Hariali* IN TRACTOR-PLOUGHED LANDS.

With reference to your D. O. letter No. 688|3714, dated 20th March 1936 and your subsequent reminder dated 14th May 1936 on the above subject, I have the honour to submit herewith statements and summaries of observations made again during the month of April and the first week in May current regarding the regrowth of *hariali* in tractor-ploughed lands.

Crop yields for 1935-36 were ascertained for all centres and more fields were inspected in the Navalgund centre and a few additional fields in the Ron taluka and they are included in the statements submitted herewith.

The data for Maradgi, Shiggaum and Mevundi centres do deal with work done with small-powered tractors and P. and O. ploughs which, experience told us, were capable of really only ten inch depth of ploughing. In the season of 1935-36 the 40TD 52 h. p. tractor and Rud-Sack Deep Tillage Plough were used and a clear depth of ploughing to 12 inches was obtained. The correct trial of the tractor ploughing for reclaiming *hariali* ridden lands may thus be said to have begun in the Navalgund centre and in Ron centre only, from last year. In these two last named centres the regrowth of *hariali* has on the whole been considerably less than what was noticed in the past at other previously worked centres and farmers are favourably impressed by the same.

Grades designed to mark the degree of regrowth of " Hariali ".

Grades.	Percentage of the field affected.
I	Upto 10 per cent regrowth.
II	From 11 to 20 per cent regrowth.
III	From 21 to 30 per cent regrowth.
IV	From 31 to 40 per cent regrowth.
V	From 41 to 50 per cent regrowth.
VI	Above 50 per cent regrowth.

Statement showing recurrence of weed, treatment of soil and crop yields in tractor-ploughed fields during the years 1933-34, 1934-35, and 1935-36.

Name of the cultivator.	Survey No.	Condition as regards *Hariali* before tractor-ploughing in percentage of area affected.	Area ploughed A.gts.	Depth ploughed.	1933-34.			1934-35.			1935-36.			Degree of weed recurrence now.
					Treatment of soil.	Crop grown.	Yield per acre.	Treatment of soil.	Crop grown.	Yield per acre.	Treatment of soil.	Crop grown.	Yield per acre.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
					Maradigi Centre. (Ploughed in 1931 summer.)									
1. Ningappa Kuri	174	VI	6—37	12"	H. 2 .. I. 3. F. Y. M. 3 carts per acre.	Jowar	..	P. 1 .. H. 3. I. 3.	Cotton	8 Mds.	H. 4 .. Sheep *folding.*	Wheat	1 bag	V
2. R. V. Kusnur ..	217 218	VI	1—20	10"	H. 4 .. I. 2 ..	Do.	240 lbs	H. 4 .. I. 2 ..	Jowar	360 lbs.	H. 4 .. P. 1 H. 2	Wheat Cotton fallow.	1 bag 5 mds.	V
3. V. S. Kulkarni ..	232	VI	4—17	10"	H. 3 .. I. 2	Do.	240 lbs.	H. 3 .. I. 2 F. Y. M. 3 carts per acre.	Do.	480 lbs.	P. 1 .. H. 3 I. 2	Cotton	6 mds.	IV
4. V. D. Patil ..	229 231	IV	7—0	10"	H. 4 .. I. 2	Do.	240 lbs.	H. 4 .. I. 2	Do.	360 lbs.	P. 1 .. H. 4 I. 2	Cotton	5 mds.	III
5. G. G. Charantimath.	72	VI	4—10	10"	H. 3 .. I. 2	Do.	240 lbs.	H. 4 ..	Wheat	240 lbs.	P. 1 .. H. 3	Do.	3 mds.	VI
6. T. H. Bajanti ..	174	VI	6—0	10"	H. 3 .. I. 2	Do	240 lbs.	H. 4 ..	Do.	220 lbs.	H. 2 .. I.	Jowar	½ bag	VI

7. Rastum Vd. Modin.	47	VI	7—0	10"	H. 3 I. 2 F. Y. M. 3 carts per acre.	Do.	240 lbs.	H. 4 .. hand-digging Rs. 16.	Do.	120 lbs.	Hand-digging Rs. 20 H. 4 for wheat. I. 3 for cotton.	Cotton Wheat	3 mds. 1 bag.	II
8. Mallappa Sungar	48	VI	8—0	10"	P. 1 .. H. 3	Cotton wheat.	3 mds. 120 lbs.	H. 4 .. I. 3 F. Y. M. 3 carts per acre Hand-digging Rs. 16.	Jowar	240 lbs.	Hand-digging Rs. 20. P. 1 H. 2	Cotton Gram fallow.	5 mds. ½ bag.	III
9. N. V. Patil ..	78/2	VI	12—0	10"	Fallow ..	..	..	H. 3 ..	Wheat	240 lbs.	H. 2 .. I. 2	Jowar	½ bag.	VI
10. A. S. Patil ..	78/1 80	VI	15—0	10"	H. 2 .. P. 1 H. 3 ..	Jowar	240 lbs.	P. 1 .. H. 3	Cotton Fallow.	5 mds.	H. 3 .. I. 2	Jowar Cotton	½ bag 3 mds.	VI
11. B. B. Nadgir ..	87	VI	21—0	10"	H. 4 .. I. 2	Cotton Jowar Wheat	4 mds. 240 lbs. 120 lbs.	P. 1 .. H. 3	Jowar Cotton.	360 lbs. 3 mds.	H. 3 .. P. 1 H. 3	Jowar .. Cotton	½ bag 3 mds.	VI
12. V. V. Sullad ..	8	VI	6—0	10"	H. 3 .. I. 2	Jowar	240 lbs.	P. 1 .. H. 3 I. 4	Do.	3 mds.	H. 4 .. Cultivates under personal supervision.	Wheat	1 bag	IV
13. Do. ..	9	VI	22—0	10"	P. 1 .. H. 4 I. 3	Cotton	3 mds.	H. 4 ..	Wheat	120 lbs.	H. 4 .. I. 2	Jowar ..	½ bag	VI
14. Do. ..	14	VI	12—0	10"	H. 4 ..	Wheat	120 lbs.	P. 1 .. H. 3 I. 2	Jowar	360 lbs.	P. 1 .. H. 4	Cotton	4 mds.	VI
15. V. Gadagkar ..	62	Clean land was ploughed.	12—0	8"	P. 2 .. H. 3	Cotton	8 mds.	H. 5 ..	Wheat	240 lbs.	P. 1 .. H. 3 .. (Cultivates himself).	Jowar .. Cotton	½ bag 6 mds.	I
Hebli.														
16. Laxmanrao Heblikar.	..	VI	38—20	10"	H. 2 ..	Wheat	Crop failed.	H. 2 .. I. 2	Jowar	120 lbs.	H. 2 ..	Gram Wheat	½ bag 1 bag.	VI
17. Do. ..	..	VI	40—0	10"	H. 4 .. I. 2	Jowar	180 lbs.	H. 4 ..	Cotton Wheat.	3 mds. 120 lbs.	H. 4 ..	Wheat Cotton	1 bag 3 mds.	IV

NOTE.—H. means Harrowings; I. means interculturings; P. means ploughing; F. Y. M. means Farm yard manure.

ANALYSIS OF REGROWTH OF *hariali* IN THE MARADGI CENTRE IN THE TRACTOR-PLOUGHED LANDS.

(10" Section).

Ploughed in Summer of 1931.

Original stand.		Regrowth observed in July 1933.						Regrowth estimated in December 1935.					
Grade.	Acres.	I.	II.	III.	IV.	V.	VI.	I.	II.	III.	IV.	V.	VI.
I ..	..	..	..	..	..	..	..	..	..	..	..	..	..
II ..	..	..	..	..	..	..	..	..	..	..	..	..	..
III ..	..	..	..	..	..	..	..	..	..	..	..	..	..
IV ..	7	..	7	..	..	..	..	..	.	7	..	..	..
V ..	..	..	..	..	..	..	..	..	.	..	..	..	..
VI ..	208	..	7	8	50	39 (12" section).	104	..	7	8	44	..	149
VII ..	7	..	7	..	..	..	..	..	..	..	7	..	..
	222	..	21	8	50	39	104	..	7	15	51	..	149

Remarks.

Observations in 1933 had indicated that about 50 per cent of the ploughed lands had shown regrowth rather severely. By January 1936 nearly 71 per cent. of the area had gone back into its original degree of *hariali* infestation.

It is difficult to estimate the benefit derived in the form of enhanced yields of crops raised in these fields as in many cases the tenants have changed and the owners could not remember these data. The season for 1933-34 which had very bad rust on wheat and cotton alone was a fair average. 1934-35 was again abnormal as rains failed and yields were very much below normal. The cultivators are, therefore, dissatisfied as they could not get full benefit from the ploughing commensurate with the amount invested.

Owners of 22 acres did derive some noticeable benefit averaging Rs. 4 to Rs. 5 per acre. The rest had practically no advantage.

Statement showing recurrence of weed, treatment of soil and crop yields in tractor-ploughed fields during the years 1933-34, 1934-35, and 1935-36.

Name of the cultivator.	Survey No.	Condition as regards *hariali* before tractor-ploughing in percentage of area affected.	Area ploughed A.gts.	Depth ploughed.	1933-34. Treatment of soil.	1933-34. Crop grown.	1933-34. Yield per acre.	1934-35. Treatment of soil.	1934-35. Crop grown.	1934-35. Yield per acre.	1935-36. Treatment of soil.	1935-36. Crop grown.	1935-36. Yield per acre.	Degree of weed recurrence now.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
12″ Section.					*Shigghon*	*Centre.*								
Bisnali.					(Ploughed in	1932	summer).							
1. S. G. Ankarkoti	31	VI	9—23	12″	W. P. 1 .. H. 2. No. F. Y. M.	*Cotton*	6 mds.	H. 4 .. I. 3 No. F. Y. M	Jowar	360 lbs	P. 1. .. H. 3 Hand-digging Rs. 30.	Cotton	6 mds.	IV.
Mannur.														
2. Rangrao Aladkatti	..	VI	8—0	12″	H. 3 .. F. Y. M. 3. carts.	Jowar	480 lbs	P. 1 .. H. 2	Cotton Jowar	4 mds. 360 lbs.	P. 1 .. H. 3	Cotton Jowar	5 mds. 2 bags	IV.
Tavarmali-halli.														
3. Doddasangappa Murigeppa.	88	VI	25—22	12″	P. 1 .. H. 2 I. 2	Cotton	5 mds.	H. 3 .. I. 2 Hand-digging Rs. 30.	Jowar	480 lbs	P. 1 .. H. 4	Jowar Cotton	½ bag 5 mds.	VI.
4. Basappa Kalganger	..	VI	4—22	12″	H. 3 .. F. Y. M. 4 carts (Cultivates himself).	Jowar	480 lbs	P. 1 .. H. 3	*Cotton*	6 mds.	H. 4 .. I. 2 F. Y. M. 3 carts.	Jowar	¼ bag	I.

Name of the cultivator.	Survey No.	Condition as regards *hariali* before tractor-ploughing in percentage of area affected.	Area ploughed	Depth ploughed.	1933-34.			1934-35.			1935-36.			Degree of weed recurrence now.
			A.gts.		Treatment of soil.	Crop grown.	Yield per acre.	Treatment of soil.	Crop grown.	Yield per acre.	Treatment of soil.	Crop grown.	Yield per acre.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Chikkanellur.														
5. Sidlingappa Desai	28	VI	15—22	12"	H. 3 .. I. 2 No. F. Y. M.	Cotton	6 mds.	P. 1 .. H. 4	Cotton	4 mds.	H. 5 .. I. 2	Jowar	½ bag	VI.
6. B. G. Patil ..	23/1	VI	9—08	12"	H. 3 .. F. Y. M. 3 carts.	Jowar Wheat	480 lbs.	H. 4 .. I. 3 ..	Jowar	480 lbs.	P. 2 .. H. 4 F. Y. M. 3 carts. Hand-digging Rs. 30.	Rala Cotton (Owner cultivates).	½ bag 6 mds.	I.
7. B. G. Patil ..	22/2	VI	9—04	12"	P. 1 .. H. 2 F. Y. M. 3 carts.	Cotton Rala. G. nut.	6 mds. 240 lbs. 800 lbs.	P. 2 .. H. 6 I. 4	Cotton	6 mds.	H. 7 .. I. 3 F. Y. M. 3 carts. Hand-digging Rs. 50.	Jowar .. (Owner cultivates).	2 bags	I.
8. Do. ..	45/2	VI	12—11	12"	P. 1 H. 2 F. Y. M. 3 carts.	Jowar ..	360 lbs. 5 mds.	P. 1 .. H. 4 I. 2	Jowar Cotton	480 lbs 4 mds.	P. 1 .. H. 3 I. 2 Hand-digging Rs. 20.	Jowar Cotton	2 bags 6 mds.	IV.
9. G. J. Adwani ..	36	VI	6—32	12"	P. 1 .. H. 2 Hand-digging Rs. 40.	Cotton	7 mds.	H. 4 .. I. 2 F. Y. M. 4 carts. Hand-digging Rs. 15.	Jowar	540 lbs.	P. 1 .. H. 4 I. 3	Cotton Jowar	4 mds. 1½ bags.	I.

10. Do.	37	VI	14—0	12"	H. 3 Hand-digging Rs. 25. F. Y. M. 3 carts.	Jowar	60 lbs.	P. 1 H. 3 I. 3	Cotton	2½ mds	P. 1 H. 3 I. 3	Cotton	6 mds.	II.
11. Rangrao Deshpande.	58	VI	5—0	12"	H. 3	Cotton Til not	8 mds. known	H. 2 I. 2	Jowar	360 lbs.	P. 1 H. 3	Do.	4 mds. Neglected.	IV.
Guundur.														
12. Bullappa Desai	47	VI	19—34	12"	H. 3 F. Y. M. 3 carts.	Jowar	120 lbs.	P. 1 H. 3 I. 3	*Cotton*	3 *mds.*	H. 2 F. Y. M 3½ carts.	Jowar	1½ bags	VI.
13. Do.	40	VI	5—22	12"	H. 3 F. Y. M. 3 carts.	Jowar Kulthi	120 lbs 60 lbs.	H. 2 I. 1	Jowar	120 lbs.	H. 3 Hand-digging Rs. 6.	Rala	½ bag	III.
14. Do.	72	VI	12—32	12"	H. 3	Wheat	80 lbs.	H. 2 F. Y. M. 3 carts. Hand-digging Rs. 40.	Jowar	120 lbs.	P. 1 H. 4 I. 2	Cotton	4 mds.	V
15. Basangaoda Patil	59	VI	8—0	12"	H. 3 F. Y. M. carts.	Jowar	120 lbs.	P. 1 H. 3 I. 2	Cotton	3 mds.	H. 2 I. 2	Jowar	2 bags	III.
(10" Section).														
Khajapur.														
16. S. [illegible]. Kulkarni	23/IB	VI	10—16	10"	P. 1 H. 4 Hand-digging Rs. 65.	Cotton	6 mds.	H. 2 I. 3	Jowar	480 lbs.	P. 1 H. 4 I. 2	*Cotton* (5 acres clean land cultivates himself).	10 mds.	VI. and rest
17. Do.	23/2	VI	8—0	10"	P. 1 H. 4	Do.	6 mds.	H. 2 I. 3	Jowar	480 lbs.	P. 1 H. 4 I. 3	Cotton (Cultivates himself).	8 mds.	III.
18. G. K. Kulkarni	23/IA	VI	10—17	10"	P. 1. H. 4	Do.	6 mds.	H. 2 I. 3.	Jowar	480 lbs.	P. 1 H. 4 I. 3	Cotton (Cultivates himself).	8 mds.	III.

Name of the cultivator.	Survey No.	Condition as regards *hariali* before tractor-ploughing in percentage of area affected.	Area ploughed A.gts.	Depth ploughed.	1933-34. Treatment of soil.	1933-34. Crop grown.	1933-34. Yield per acre.	1934-35. Treatment of soil.	1934-35. Crop grown.	1934-35. Yield per acre.	1935-36. Treatment of soil.	1935-36. Crop grown	1935-36. Yield per acre.	Degree of weed recurrence now.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10" Section—contd. *Khalayur—contd.*														
19. Basayya Bisnalli	34	VI	9—28	10"	P. 1 .. H. 2	Cotton G. nut.	6 mds. 2 bags	P. 2 .. H. 3 I. 3	Cotton Jowar	4 mds. 240 lbs.	H. 3 .. I. 2	Jowar Rala (Culticates	½ bags 1 bag. himself).	
Musavli.														
20. S. G. Kulkarni	92	VI	19—07	9"	P. 1 .. H. 2	Jowar	480 lbs.	P. 1 .. H. 4	Cotton	10 mds	P. 1 .. H. 4 I. 2 F. Y. M. 3 carts.	Jowar (Cultivate	3 bags. s himself).	III.
21. G. M. Savanur	101/1	VI	5—30	9"	H. 4 F. Y. M. 3 carts. Hand-digging Rs. 10.	Do.	480 lbs	P. 1 .. H. 4 Hand-digging Rs. 20.	Do.	4 mds.	P. 1 H. 4	Cotton Chillies n	6 mds. ot availa	III. ble.

NOTE.—H. means harrowing ; I. means inter-culturing ; P. means ploughing ; W. P. means wooden plouging.

ANALYSIS OF OBSERVATIONS ON REGROWTH OF *Hariali* IN TRACTOR-PLOUGHED LANDS IN THE *Shiggaum Section.*

(Ploughed in summer of 1932.)

Original stand.		Regrowth observed in July 1933.						Regrowth observed in December 1935 and April 1936.					
Grade.	Acres.	I	II	III	IV	V	VI	I	II	III	IV	V	VI
					(I inch Section.)								
I	..	..	..	..	..	..	..	..	..	..	..	..	..
II	..	..	..	..	..	..	..	..	..	..	..	..	..
III	..	..	..	..	..	..	..	..	..	..	..	..	..
IV	..	..	..	..	..	..	..	..	..	..	..	..	..
V	..	..	..	..	..	..	..	..	..	..	..	..	..
VI	177	11	54	41	16	..	54	25	14	13	38	..	87
					(10 inch Section.)								
VI	62	..	43	..	..	..	19	6	..	53	..	..	9
Totals—VI	239	11	97	41	16	..	73	25	14	66	38	..	96

Remarks.

All the area ploughed at this centre was in the VI grade of infestation before it was ploughed. In the 12 inch section there has been gradual deterioration of the fields and 87 acres have gone back to their original condition against only 54 in 1933. In the 10 inch section 10 acres have improved from VI grade to III grade but 43 acres in the II grade slided down to the III grade. Inquiries show that a few landlords got the regrowth dug out by manual labour in about ten fields and a few peasant farmers gave careful cultivation and these efforts checked the deterioration of these fields to some extent.

Crop yields were ascertained to as fair an accruacy as could be possible and are only indicative. This centre suffered from excess of rainfall in 1933-34 and jowar was a partial success and cotton gave only fair yields. The 1934-35 season was also not very encouraging and this coupled with the acute economic depression and low rates for produce has not enabled the landlords to recoup what they invested in ploughing these lands. In better seasons the results should have been more favourable. The 1935-36 season also was only an average and summarising as a whole, 39 acres in the 12 inch section may be said to have realised an annual benefit of Rs. 6 per acre and 51 acres only Rs. 3 to Rs. 4 per acre. In the 10 inch section 53 acres may be estimated to have realised about Rs. 4 per acre and the rest had practically no advantage.

Statement showing recurrence of weed, treatment of soil and crop yields in tractor-ploughed fields during the years 1933-34, 1934-35, and 1935-36.

Name of the cultivator.	Survey No.	Condition as regards *Harali* before tractor-ploughing in percentage of area affected.	Area ploughed	Depth ploughed.	1933-34. Treatment of soil.	1933-34. Crop grown.	1933-34. Yield per acre.	1934-35. Treatment of soil.	1934-35. Crop grown.	1934-35. Yield per acre.	1935-36. Treatment of soil.	1935-36. Crop grown.	1935-36. Yield per acre.	Degree of weed recurrence now.
1	2	3	A.gts. 4	5	6	7	8	9	10	11	12	13	14	15
Meundi.					(Ploughed in	*Meundi* Centre,	summer	of 1932.)						
1. M. N. Kavalur	31	VI	3—03 14—03	12" 9"	H. 2 .. I. 2 ..	Jowar	240 lbs.	H. 1 .. I. *Nil* ..	Cotton	Famine drought.	H. *Nil* ..	Cotton Neglected.	2 mds.	III
2. Jagannathbhat Puranik.	462 463	VI	16—05 16—31	12" 9"	H. 2 ..	G. nut Cotton Wheat Gram	2 bags 2 mds. 120 lbs. 60 lbs.	H. 1 ..	Not sown due to drought.		H. 1 .. I. 2 ..	Cotton Wheat Safflowers	1½ mds. ¼ bag. 1 bag.	VI VI
3. Virupaxabhat Rajapurohit.	462/2	VI	4—12 1—0	12" 9"	H. 2 ..	Rala Wheat Gram	*Nil* 120 lbs. 60 lbs.	H. 1 ..	Do.		H. 1 ..	Wheat Safflower	¼ bag. ½ bag.	VI
4. K. B. Kulkarni	57 59	VI	13—34½ 14—00	12"	H. 2 .. I. 1 ..	Jowar	240 lbs.	H. 1 ..	Do.		H. 1 ..	Jowar	1 bag.	IV
					H. 2 .. I. 1 ..	Jowar	240 lbs.	H. 1 ..	Do.		H. 1 ..	Cotton	2½ mds.	VI
5. Ramkrishnabhat Sugur.	102 103	VI	10—20	12"	H. 2 .. Hand-digging Rs. 20.	G. nut Wheat	4 bags 120 lbs.	H. 1 ..	Do.		H. 1 I. 1 ..	Cotton	3 mds.	I
6. Narsingrao Nadagouda.	36 32	VI VI	5—08 8—31	12" 12"	Do. Ploughing 1 Hand-digging Rs. 50.	Cotton	3 mds.	Hand-digging Rs. 50. H. 1 ..	Do.		H. 1 ..	Do.	2 mds.	I
7. B. S. Padaki ..	61 62 63	VI	20—27 22—02 6—21	12" 10" 9"	H. 2 .. H. 1 ..	Do.	3 mds.	H. 1 ..	Do.		H. 1 ..	Do. ..	3 mds. Neglected.	IV
8. M. K. Joshi ..	37/3 38/3	VI	13—00	12"	H. 2 .. I. 1 .. Hand-digging Rs. 39.	Jowar G. nut	240 lbs. 800 lbs.	H. 1 .. Hand-digging Rs. 10.	Drought		H. 1 ..	Jowar ..	1½ bag.	I

Meundi—contd. 9. M. M. Joshi ..	37/2 38/2	VI	10—03	12″	H. 2 .. Hand-digging Rs. 30.	Jowar G. nut	240 lbs. 800 lbs.	H. 1 .. Hand-digging Rs. 10.	Drought		H. 1 ..	Jowar	1½ bags.	I
10. B. K. Jir ..	482 481	VI	7—38 9—10	12″ 10″	P. 1 .. H. 2 ..	Cotton	30 lbs.	H. 1 ..	Do.		H. 1 .. I. 2 ..	Jowar Cotton	½ bag 2 Mds.	VI
Haitapur. 11. Narsingrao Nadgouda.	152	VI	10—33	12″	H. 2 ..	Do.	50 lbs.	H. 1 ..	Do.		H. 1 ..	Jowar	½ bag.	VI
Bardur. 12. Vasappa Ellur	117	VI	19—00	12″	H. 3 .. I. 1 .. Hand-digging Rs. 20.	Jowar	2 bags.	H. 2 ..	Do.		H. 2 ..	Cotton	3 Mds.	I
13. Sannappa Gadag	262	VI	3—22	12″	H. 3 .. I. 1 ..	G. nut	800 lbs.	H. 1 ..	Do.		P. 1 .. H. 2 ..	Jowar G. nut	1 bag. 750 lbs.	III
14. D. A. Angadi ..	231	IV	8—00	12″	H. 2 .. I. 1 ..	Jowar	1 bag.	*Nil*	*Nil*		H. 1 ..	Jowar	½ bag.	III
Mundargi. 15. Narsingrao Nadgouda.	169	VI	9—21	12″	H. 2 ..	Do.	1 bag.	H. 1 ..	Drought		H. 1 ..	Do.	½ bag.	IV
Tambargund 16. A. G. Kulkarn	190	VI	13—27	12″	H. 2 .. I. 1 ..	Do.	1 bag.	H. 1 ..	Do.		H. 2 ..	Cotton Wheat	2 mds. *Nil*	IV
17. Fakirsab Malekop	109	VI	6—15	12″	H. 2 .. I. 1 ..	Do.	1 bag.	H. 1 ..	Do.		H. 1 ..	Jowar	1 bag	III
18. Hanamavva Totagar.	195	VI	3—25	12″	H. 3 .. I. 1	Do.	1 bag.	H. 2 ..	Do.		H. 2 ..	Cotton	2 mds.	VI

NOTE.—H. Means harrowing; I. means Inter-culturing; P. means ploughing.

ANALYSIS OBSERVATIONS IN REGROWTH OF *Hariali* IN TRACTOR-PLOUGHED LANDS IN THE *Meundi centre.*

(Lands ploughed in summer of 1932.)

Original stand.		Estimated regrowth of *Hariali* in July 1933.						Estimated regrowth of *Hariali* in December 1935.					
Grade.	*acres.*	I	II	III	IV	V	VI	I	II	III	IV	V	VI
						(12" Section.)							
I	..	..	..	..	..	..	..	..	..	..	..	..	..
II	..	..	..	..	..	..	..	..	..	..	..	..	..
III	..	..	..	..	..	..	..	..	..	..	..	..	..
IV	..	..	..	..	..	..	..	..	..	..	..	..	..
V	..	..	..	..	..	..	..	..	..	..	..	..	..
VI	188	47	133	8	..	..	..	66	..	35	44	..	43
						(10" Section.)							
VI	69	..	60	9	..	..	..	..	..	14	28	..	27
	257	47	193	17	..	..	..	66	..	49	72	..	70

Remarks.

The observations were restricted this time to lands where regrowth was estimated in 1933. As the soil and other conditions at Kalasapur and Huilgol differ very materially from those at the Meundi, those villages have been *excluded* from the present observations to facilitate correct comparison.

By 1933, the total area of 257 acres observed had shown only moderate regrowth in both the 10" and 12" sections. By January 1936, however, on 28 per cent of the area in the 12" section and 39 per cent in the 10" section the *hariali* has re-established itself to the original degree. A few landlords did get the growth hand-dug and 66 acres have thus been retained in the first grade. The rest have shown increased regrowth of the weed.

This centre is often subject to scarcity and only 1933-34 had 5 anna crop, and the season for 1934-35 was a total failure when crops failed entirely due to drought and even that of 1935-36 is also below average. Due to these circumstances, the benefit from ploughing has been less noticeable in this centre than in the others and landowners have not been able to get back what they invested in ploughing the land in most cases.

Name of the cultivator.	Survey No.	Condition as regards *Hariali* before tractor-ploughing in percentage of area affected.	Area ploughed A. Gts.	Depth ploughed.	1935-36. Treatment of soil.	1935-36. Crop grown.	1935-36. Yield per acre.	Degree of weed recurrence now.
			Navalgund Centre.					
			(Ploughed in 1935 summer).					
Navalgund.								
1. Shree Pattad Devaru Guru Baslingdevaru.	831	VI	20—15	12″	Harrowings ..2 Intercultnrings 2	Cotton .. Gram ..	Not available	II
2. Venugopalacharya Ghodibhavi.	315	VI	23—30	12″	Ploughing ..1 Harrowings ..2 Interculturings ..2	Cotton .. R. Jowar	6 mds. .. 1¼ bag. ..	II
3. Venkatesh Krishna Gudi	47A	VI	8—30	12″	Harrowings ..2 Interculturings ..1	Cotton ..	6 mds. ..	VI
Belvatgi.								
4. P. S. Shetti	339	VI	14—35	12″	Harrowings ..2 Interculturings ..2	Cotton .. Wheat R. Jowar ..	5 mds. .. 1 bag. .. 1 bag. ..	II
5. Do.	220	VI	23—00	12″	Harrowings ..2 Interculturings ..2	Cotton .. Wheat ..	5 Mds. .. 1 bag.	II
6. T. M. Shetti	219/1	VI	12—17	12″	Harrowings ..2 Interculturings ..2	Cotton .. Wheat ..	4 mds. .. 1½ bag.	II
7. C. P. Shetti	219/2	VI	12—11	12″	Harrowings ..2 Interculturings ..2	Cotton .. Wheat	4 mds. .. 1½ bag.	II
8. D. K. Dharwar	21 23	V	22—10	12″	Harrowings ..4 Interculturings ..2	Cotton ..	8 mds. ..	III

Name of the cultivator.	Survey No.	Condition as regards *Hariali* before tractor-ploughing in percentage of area affected.	Area ploughed A. Gts.	Depth ploughed.	1935-36. Treatment of soil.		Crop grown.	Yield per acre.	Degree of weed recurrence now.
***Navalgund*—contd.**									
9. Laxmibai R. Hebsur ..	248	VI	7—30	12″	Harrowings Interculturings	..2 ..2	Cotton ..	4 mds. ..	II
10. Kallappa Dyamappa ..	163	V	7—30	12″	Harrowings Interculturings	..2 ..2	Cotton ..	8 mds. ..	II
Padesur.									
11. D. K. Dharwar	263	VI	19—35	12″	Harrowings Interculturings	..2 ..2	Cotton ..	5 mds. ..	II
12. L. K. Puranik	162 163	VI	10—00	12″	Harrowings Interculturings	..3 ..3	Cotton .. Gram ..	8 mds. .. 2 bags.	I
Yamnur.									
13. N. J. Kulkarni	38	IV	9—13	12″	Ploughing Harrowings Interculturings	..1 ..2 ..3	Cotton .. R. jowar	20 mds. .. 4 bags.	III
14. L. A. Kulkarni	160 161 97	VI	48—26	12″	Ploughing Harrowings Interculturings	..1 ..2 ..2	Cotton .. Gram, cotton and wheat.	4 mds. .. ¼ bag.	I
Arban.									
15. G. G. Pujari	57	VI	22—0	12″	Harrowings Interculturings	..2 ..1	Cotton ..	4½ mds. ..	I
16. D. M. Deshpande ..	107/1,2	VI	15—0	12″	Harrowings Interculturings	..2 ..1	Cotton ..	12 mds. ..	I

Somapur.								
17. V. R. Gosavi	100	VI	17—39	12″	Harrowings .. 2 Interculturing .. 1	Cotton ..	6 mds. ..	I
Petha.								
18. Hanamantgouda Patil ..	100	VI	12—16	12″	Harrowings .. 2 Interculturing .. 1	Cotton ..	6 mds. ..	I
Dandapur.								
19. L. A. Godase	337	VI	27—36	12″	Harrowings .. 2 Interculturings .. 2	Cotton .. R. jowar	4½ mds. .. 1 bag.	III
20. Y. G. Dixit	227/2 227/1 228/8 229/2	VI	32—8	12″	Harrowings .. 3 Interculturings .. 2	Cotton .. R. jowar	6½ mds. .. *Nil.*	I
21. K. L. Limaye	47/3	VI	6—17	12″	Harrowings .. 2 Interculturings .. 2	Cotton .. Fallow.	4 mds. ..	I
22. S. G. Pujari	41/2	VI	8—00	12″	*Do.*	Cotton ..		I
23. Do.	457/2	VI	3—05	12″	*Do.*	Do. ..	7 mds. ..	III
23*a*. D. Y. Deshpande.. ..	487	VI	14—00	12″	*Do.*	Do. ..	7 mds. ..	II
24. Do.	485	VI						
25. J. B. Sondur	478	VI	16—32	12″	*Do.*	Do. ..	6 mds. ..	II
26. Chandarsani	475/1	VI	6—35	12″	Do.	Do. ..	7 mds. ..	II
27. G. V. P[illegible]ohit	486	VI	16—19	12″	Harrowings .. 2 Interculturings .. 2	Do. ..	5 mds. ..	II
28. B. R. Patarad	437 433	VI	21—10	12″	Do.	Do. ..	5½ mds.	I
29. G. N. Dixit	208	VI	21—00	10″	Harrowings .. 3 Interculturings .. 3	Cotton .. Wheat ..	3 mds. .. *Nil.*	I

Name of the cultivator.	Survey No.	Condition as regards *Hariali* before tractor-ploughing in percentage of area affected.	Area ploughed. A. Gts.	Depth ploughed.	1935-36. Treatment of soil.	1935-36. Crop grown.	1935-36. Yield per acre.	Degree of weed recurrence now.
Dandapur—contd.								
30. G. N. Dixit	348/2	IV	5—30	10″	Harrowings .. Intercultarings .. Do.	Wheat ..	1 bag.	I
31. M. K. Alur	176 177/2	VI	34—16	12″		Cotton .. R. jowar .. Wheat ..	4 mds. .. *Nil.* 1 bag.	II
Karavinkop.								
32. P. V. Gudisagar	64 65	VI	13—02	12″	Do.	Cotton ..	4 mds. ..	I
Jogapur.								
33. S. V. Joshi	188	VI	17—19	12″	Do. 2 2	Cotton ..	Not available	II
Benkoppa.								
34. D. S. Dhupavar	130/2	VI	11—30	12″	Do.	Do. ..	6 mds. ..	I
Chikkanargund.								
35. Basavva Patil	11 12	VI	44—19	12″	Harrowings .. 3 Intercultarings .. 2	Do. .. Wheat ..	3 mds. .. *Nil.*	I
Bel-vatigi.								
36. M. D. Joti	143	VI	9—00	12″	Harrowings .. 2 Intercultarings .. 2	Cotton ..	5 mds. ..	I
37. Channappagouda Patil ..	346	VI	9—10	12″	Ploughing .. 1 Harrowings .. 2 Intercultarings .. 2	Do. ..	5 mds. ..	II

Basavapur.									
38. Mahadevappa Angadi ..	226 227 247	VI	44—25	12″	Do. ..	..	Do. ..	2½ mds. ..	I
Kal-vada.									
39. Laximibai N. Sagar ..	39·45 68/3	VI	22—12 8—25 8—04	12″	Ploughings Harrowings Interculturings	.. 1 .. 2 .. 2	Cotton .. R.jowar ..	5 mds. .. *Nil.* ..	IV II II
40. V. R. Kulkarni	40 296	VI	19—31 9—04	12″	Do. ..	..	Cotton .. Do. ..	6 mds. .. 3½ mds. ..	IV III
41. B. A. Joshi	69/1	VI	9—12	12″	Do. ..	..	Cotton ..	3 mds. ..	II
Karlwad.									
42. V. G. Malgiri	18	VI	4—34	12″	Ploughings Harrowings	.. 2 .. 4	R.jowar ..	1½ bags ..	III
43. L. B. Kulkarni	8 9	VI	15—0	12″	Harrowing	.. 1	Wheat .. R.jowar ..	*Nil* .. 1 bag.	IV
44. Do.	84	VI	16—0	12″	Harrowing	.. 1	Cotton .. Wheat Gram	1½ mds. .. ½ bag. 1 bag.	I
Arekurhatti.									
45. A. L. Kulkarni	25 29	VI VI	13—2	12″	Harrowings Interculturing	.. 2 .. 1	Gram .. Cotton ..	2 bags .. 3 mds. ..	IV
46 V. L. Kulkarni	35 34	VI	14—0	12″	Do. ..	..	Cotton ..	6 mds. ..	III
Hebsur.									
47. R. D. Mudiraddi	45	VI	28—28	12″	Do. ..	..	Do. ..	10 mds. ..	II
48. A. L. Kurdikeri	234/1	VI	12—0	12″	Do. ..	..	R.jowar .. Cotton ..	1½ bags .. 9 mds.	II

Navalgund Centre.

Ploughed during the summer of 1935, with TD-40 tractors and Rud-Sack Deep Tillage Ploughs.

Original stand of *kariali*.		Regrowth of *kariali* observed in April and May 1936.					
Grade.	Acres.	I.	II.	III.	IV.	V.	VI.
IV	15—3	5—30	..	9—13	..	..	..
V	30—0	..	7—30	22—10	..	..	..
VI	87—39	353—32	316—13	58—39	70—5	..	8—30
Totals ..	853—2	359—22	324—3	90—22	70—5	..	8—30

Remarks.

The area inspected during the months of April and May 1936, covers nearly 87 per cent of the total area ploughed at this centre during the summer of 1935. All this area was more or less severely infested (IV to VI grades) and was unprofitable to cultivate without removal of the *kariali*. After ploughing, 42 per cent of the inspected area showed regrowth within the I grade and 38 per cent had it within the II grade. Thus 80 per cent. of the ploughed area had very slight regrowth within the economic possibilities of the farmer to remove it by manual labour. In the rest 161 acres showed moderate regrowth (III and IV grades) and only 9 acres failed to show any improvement. The yields obtained per acre in the ploughed lands averaged 5 to 6 maunds of cotton worth about Rs. 10 to Rs. 12.

It may be of interest to analyse these data further. Lands situated on the banks of the Benni Nalla have shown in most cases 30 per cent regrowth but they have also given increased yields by far exceeding those in fields in the interior. The solitary case of one field showing regrowth up to the VI grade has a soil very much unlike the average soil of this tract. This soil is full of lime and does not crack and when ploughed crumbles into fine loose mulch and thus does not dry early.

The results on the whole may be said to be more encouraging than in the past and local farmers are satisfied with the same as the regrowth is within economic possibilities of its removal by manual labour.

Name of the cultivator.	Survey No.	Condition as regards *Hariali* before tractor-ploughing in percentage of area affected.	Area ploughed. A. Gts.	Depth ploughed.	1935-36. Treatment of soil.	1935-36. Crop grown.	1935-36. Yield per acre.	Degree of weed recurrence now.
Ron.				*Ron Centre.* (Ploughed in 1934-35.)				
1. Virupaxappa Kulkarni ..	963 915	VI	43—00	12″	Ploughing .. 1 Harrowings .. 2 Intercultarings .. 2	Cotton ..	15 mds. ..	II
2. Paravatgouda Patil ..	926	VI	11—35	12″	Do.	Do. ..	12 mds. ..	III
3. Virupaxappa Kulkarni ..	623 624 625 635		45—00	12″	Do. (rain within a week and sowing delayed by rain, etc.)	Do. ..	2 mds. ..	IV
Krishnapur.								
4. Virupaxappa Kulkarni ..	55 52 50	VI	50—00	12″	Do. (do.)	Do. ..	3 mds. ..	III
Jiglur.								
5. Bishtappa Kulkarni ..	76 123 240 256 171	VI	48—00	12″	Harrowing .. 1 Intercultarings .. 2 (rain within 10 days after ploughing), Crop suffered by insufficient rain.	Do. ..	2 mds. ..	III
6. M. K. Kulkarni ..	220 25/1	VI	15—00	12″	Harrowing .. 1 Interculturing .. 1 (rain within 10 days after ploughing).	Do. ..	3 mds. ..	III

Name of the cultivator.	Survey No.	Condition as regards *Hariali* before tractor-ploughing in percentage of area affected.	Area ploughed. A. Gts.	Depth ploughed.	1935-36. Treatment of soil.	1935-36. Crop grown.	1935-36. Yield per 2 acre.	Degree of weed recurrence now.
Ron—contd.								
7. Balappa Kulkarni ..	75/2 259	VI	15—00	12″	Harrowing .. 1 Interculturing .. 1 (rain within 10 days after ploughing).	Cotton ..	3 mds. ..	III
8. Basangouda Patil ..	237/3-A 189/2	VI	6—00	12″	Do. do. ..	Do. ..	4 mds. ..	II
9. Mahadevgouda Patil ..	42/2 49/2	VI	3—17 1—24 18—38	12″	Harrowing .. 1 Interculturings .. 2	Cotton ..	7 mds. .. (late rains. Spoiled 3rd picking).	III.
	53 56 57	VI	28—28	12″	Harrowing .. 1 Interculturings .. 2	Do. ..		
	59 61 62/2	VI	12—32 25—10 21—14 5—80	12″	Do.	Do.		
	65 75 80/2 89 122 123 124/1	VI VI VI VI VI VI VI	17—36 27—00 6—20 26—60 22—00 17—20 4—00	12″	Do. .. .	Do.		

ANALYSIS OF OBSERVATIONS ON REGROWTH OF *hariali* IN TRACTOR-PLOUGHED LANDS IN THE RON SECTION.

(Ploughed during summer of 1935.)

Original stand.		Regrowth observed on May 1936.						
Grade.	Acres.	I.	II.	III.	IV.	V.	VI.	Remarks.
I	..	..	..	..	..	..	..	
II	..	..	..	..	..	..	..	
III ..	..	..	..	..	..	..	..	
IV	..	..	..	..	..	..	..	
V ..	..	..	..	..	..	..	..	
VI	435—30	..	43—0	347—30	45—0	..	..	

Remarks.

All the area ploughed in this section was in the VI grade of infestation before it was ploughed, varying from 60 per cent to 90 per cent infestation. Out of the total area of 617 acres ploughed in this section as many as 436 acres were inspected for estimating the re-growth. Of the area inspected 238 acres were at Hole-Mannur on the banks of the Malaprabha River and had deep black soil with *hariali* possibly deep-rooted. These were ploughed in the 2nd fortnight of March 1935, and has a light shower within a fortnight after ploughing. They have all shown regrowth of the *hariali* up to the III grade.

The rest of the area inspected was ploughed in April 1935 and had heavy rain within a fortnight after ploughing at Ron, Krishnapur and Jiglur. Observations made regarding regrowth show that out of the total area of 198 acres inspected in this area 43 acres improved to the II grade and 45 got into the IV grade and 110 acres came into the III grade. Obviously this heavy regrowth was due to the heavy rains following the ploughing immediately.

Yields observed in all these fields indicated that at Hole-Mannur an average yield of 7 maunds cotton per acre was obtained in lands which were practically lying unproductive before due to the *hariali*.

At Ron only 53 acres of red-mixed black soil gave as much as 15 maunds cotton per acre whereas in other fields the crop suffered from lack of moisture in soil at later stages of growth. In all cases the crop could not give the third picking as it had an untimely ante-monsoon shower and *kapas* dropped down, etc.

TRACTOR PLOUGHING.

Re-growth of *Hariali.*

Comments by Burmah-Shell Oil Storage and Distributing Co. of India, Ltd., on the Report prepared by the Director of Agriculture, Bombay Presidency.

When experimental work with tractors for the eradication of deep-seated weeds was first started in 1932 there was, for all practical purposes, no knowledge whatsoever as to whether tractors could be effectively used in the eradication of deep-seated weeds ; nor was there any data or other experience available as to suitable types of tractors and ploughs for this work, and the first problem that had to be tackled, therefore, was to find out the depth of ploughing that was required to eradicate the weed and the power of the tractor and the type of plough that could best do this work. The history of the experiments is contained in Scientific Monograph No. 9 issued by the Imperial Council of Agricultural Research entitled "Mechanical Cultivation in India ". It is perhaps not entirely a fair comparison to compare the results obtained during the experimental period with the work now being carried out with suitable tractors and ploughs, but the Director of Agriculture's report is of the greatest possible value and importance as showing the steady improvement in the degree of re-growth of the weed now that suitable implements are available. It is only by a careful study of the degree of regrowth and the crop yields that it is possible to arrive at any sound conclusion regarding the value of the work carried out in the past and now being carried out on a commercial scale.

Special attention is invited to the analysis of results attached to the Director of Agriculture's report, with special reference to the satisfactory results obtained during 1935, when compared with those obtained in 1931-32, the reasons for which are explained later in this note.

The first point that arises from a study of this report is the steady improvement in the regrowth since the work was first started in 1931. Between 1931 and 1934, the work was definitely and admittedly of an experimental nature and a large number of different types of tractors and ploughs were utilised in order to enable a decision to be arrived at as to the most suitable type of tractor and plough to be used for the eradication of weed, as also of the power required to pull the selected implements. The depth of ploughing is a most important point, as on this really depends the whole degree of eradication. During the first year of the work ploughing to a maximum of 10″ depth was carried out, but in most cases this depth was not reached due to the tractor being under-powdered and the ploughs being of the wrong type. The work now being carried out is to a minimum depth of 12″ and frequently a greater depth than this is ploughed. For effective eradication 12″ can be regarded as the minimum, which is one of the important points that has been established as a result of the work in the past. This is a very important factor which should be borne in mind when considering the results shown in the first 3 analyses of the Director of Agriculture's report for land ploughed in the summers of 1931 and 1932. Although, however, the regrowth was heavy, and, it must be admitted, certain of the

landlords and cultivators were dissatisfied with the results they obtained, most of them were entirely satisfied with the increase in crop yield, which in most cases enabled them to pay for the cost of the work within two years.

There are two other important factors that must be borne in mind when considering the experimental work carried out between 1931 and 1934. The first is that in addition to complete inexperience as to suitable tractors and implements for this type of work, there was also complete ignorance as to the periods when deep ploughing should be carried out in order to ensure as complete eradication as possible.

Whilst it was quickly appreciated that ploughing should not be done during the rains, or even immediately before or after, in view of the obvious risk of re-germination, it was only recently realised, as a result of experimental work and of the surveys carried out during the last two years, that ploughing can be carried out even if there is moisture in land provided it does not go deeper than the roots which are to be ploughed out.

Certain of the regrowth is due, therefore, to ploughing having been carried out in the initial periods too soon after the rains and too close to the beginning of the rains.

The third, an equally important factor, that must be considered is the necessity for hand-digging those portions of weed which have not been properly eradicated or ploughed. This is partly due to the cultivators in most cases being so satisfied with the largely improved yields that were obtained as a result of the deep ploughing, that they have taken no trouble to carry out the necessary hand-digging. If hand-digging of any infested patches are carried out, then there can be *complete* eradication, but not otherwise, and the agricultural authorities are doing all they can to impress upon the cultivators the importance of hand-digging when necessary. The importance of hand-digging is shown by the fact that the percentage of regrowth is an increasing factor, for example in the Maradgi centre ploughed in 1931, the regrowth in 1933—two years later—was 50 per cent, whilst in 1936—5 years later—it had increased to 71 per cent. This could have been largely prevented if judicious hand-digging had been carried out.

The results obtained in the summer of 1935 in the Navalgund centre and in the Ron section with deep-tillage ploughs showed a very considerable improvement, whilst crop yields also improved.

In the Navalgund section 807 acres out of the 853 acres ploughed during the summer of 1935, contained over 50 per cent of area affected with *hariali*. The regrowth observed in the following year showed that of the area ploughed 353 acres had only up to 10 per cent regrowth, 316 between 11—20 per cent regrowth, 58 acres between 21—30 per cent, 70 acres between 31—40 per cent and 8 acres above 50 per cent. The 8 acres showing no improvement is attributed to the soil of the field in question being full of lime, which when ploughed cr mbles into fine dust and mulch and does not dry early. As the Director of Agriculture observes, 80 per cent of this area had very slight regrowth within the

economic possibilities of the cultivator to remove it by manual labour, whilst the yields obtained per acre averaged 5|6 maunds of cotton worth Rs. 12.

It will be noted that in the Ron section, the Director of Agriculture attributes some of the unexpected regrowth to the heavy rain immediately which followed the ploughing.

Whilst much work has still to be done in connection with the botanical research into the characteristics of ***hariali,*** it is felt that the results now being obtained afford full justification for the view that suitable equipment has now been found for carrying out this all important work of weed eradication.

C. P. G. WADE,
For Burmah-Shell,
Oil Storage and Distributing Company
of India, Limited.

BOMBAY ;
The 15th June 1936.

APPENDIX XXVII.

Report of the Tractor Sub-committee held at Rock House on 15th July 1936.

PRESENT :

Dr. F. J. F. SHAW (*Chairman*).

Dr. W. BURNS.

Mr. W. J. JENKINS.

Khan Bahadur Maulvi FATEH-UD-DIN.

Mr. J. C. MCDOUGALL.

Mr. C. H. PARR.

Mr. D. R. SETHI.

Visitors.

Mr. W. E. BUSHBY.

Mr. C. P. G. WADE.

Report of the tractor ploughing work conducted by the Burmah-Shell Company, during 1935, item 16 of the agenda.

With reference to the observations recorded on the life of a tractor, the sub-committee suggest that the life of a tractor will depend to a certain extent on the type of soil in which it is working and the depth of ploughing. Under the conditions described in the report it appeared that 7,000 to 8,000 hours might be taken as a fair life for a tractor.

The sub-committee considered that the question which type of implement was most suitable for grass eradiction depended very largely on the type of the soil and the grass which had to be eradicated.

In the case of comparison of the Fowler and the McCormick units more detailed information on the time analysis particularly with regard to the reasons for time spent under repair would be useful. The sub-committee felt generally that more information was required before accurate conclusions as to the merits of these outfits could be drawn.

Tractor work in Dharwar district during 1934-35 season.

In the *hariali* infested districts of southern Mahratta, the sub-committee noted the success which had been achieved in the eradication of deep-rooted weeds with the Rud-Sack plough in cases in which this ploughing had been followed in the succeeding year by hand-digging. The sub-committee direct attention to page 9 and pages 19—21 of the annexure. Hand picking and digging, while necessary in southern Mahratta areas, were not necessary in other areas such as the northern Central Provinces. The sub-committee noted that the Bombay Agricultural Department had been observing on the botanical side, the moisture conditions of the soil and of the weed and the temperature conditions of the soil and of the air in connection with the death point

of *hariali*. The working period available for a tractor in which it could usefully eradicate *hariali* weeds would depend upon these conditions. The sub-committee commended favourably the work of the Company and the Bombay Department of Agriculture on this question.

Practical work by Hanomag tractors.

The sub-committee noted the information on Hanomag tractors and recorded the same.

Trend of tractor and implements design.

The sub-committee noted the information on the trend of tractor and implement design and the Rud-Sack plough.

APPENDIX XXVIII

Report of the Dry Farming Schemes Co-ordination Committee held on the 16th July at 2-30 p.m.

PRESENT :

Dr. F. J. F. SHAW (*Chairman*).

Dr. W. BURNS.

Mr. DALIP SINGH.

Mr. N. V. KANITKAR.

Mr. P. G. KRISHNA.

Mr. C. H. PARR.

Mr. H. B. RAJDEV.

Mr. R. L. SETHI.

Mr. A. SUBHA RAO.

Rao Bahadur M. VAIDYANATHAN.

Mr. C. VIJAYARAGHAVAN.

Rao Bahadur B. VISWANATH.

(*Visitors*).

Professor N. R. DHAR.

Mr. H. L. DUTT.

Professor P. PARIJA.

[*Progress reports (not printed) of the dry farming research scheme 1935-56 in Hyderabad Deccan (item 22 of the agenda).*]

The Committee noted that in the report for 1933-35 on page 18 in the paragraph relating to manuring, one cart-load of farmyard manure was considered equivalent to 1,000 lbs. of dry manure. The 1935-36 report was received during the meeting. The experiments of which details are given on pages 14 onwards, should be criticised by the Statistician to the Research Council. The Committee noted that the calculation of the critical difference in all experiments was incorrect. The Committee noted that the standard error of the plots was very high, due to the fact that the land had recently been levelled, and recommend that in experiments on this land the number of replications should be increased to at least 10. The Committee would call attention to the fact that green-manuring with sann-hemp depends for its success on sufficient rainfall to ensure the rotting of the sann-hemp in the soil and that it might not be suitable for all dry-farming areas although an important method for adding organic matter to the soil.

The Committee approved of the reports.

First Annual report (not printed) of the dry-farming scheme (Rohtak) Punjab for 1935-36 item 22 (i) of the agenda.

The Committee approved of the scheme of cultural experiments on page 2.

The Committee approved of the seed-rate experiments but with regard to the manurial experiments, they called attention to the very heavy applications of farmyard manure which were being given. In the inter-culture experiments, the Committee called attention to the size of the plot—1|10th of an acre.

The Committee recommend that the rotational experiments should be examined by the Statistician to the Council with a view to their possible simplification. Rotational experiments should in any case have some relation to local practice.

The Committee expect in succeeding years under the heading crop experiments, that a scheme of experiments will be laid down, in accordance with the original programme, with these crops which the first year's work have shown to be suitable to this tract.

The Committee did not consider that the experiments carried out to determine the drought-resistant properties of *bajra*, were likely to yield any results of value. The word tap root in the root studies was a misnomer.

The Committee consider that at the next meeting of the Dry Farming Co-ordination Committee, when the Punjab, Hyderabad and the Bombay schemes will have had another year's work, all the schemes should be closely examined with a view to correlating their results and the Committee hoped that Mr. Kanitkar would draft points for consideration. They consider that the trials of the Bombay *jawars* should be extended to the Rohtak farm and conversely *jawars* on the Rohtak farm should be supplied to the other dry farming schemes. Subject to these criticisms, the Committee approved of the report.

APPENDIX XXIX.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 10th June 1936, on Subject No. 26 :—Agricultural Marketing, Progress Report—June 1936.

Following on the recommendations made at the last meeting of the Advisory Board, copies of the marketing reports for Delhi Province were circulated to local Marketing Officers for information and guidance.

A Conference of Marketing Officers was held at Delhi from 27th April to 2nd May. Copies of the proceedings (not printed) have been circulated. The Conference specially considered the simplification of procedure and the allocation of survey work between Central and Local Staffs. Synopses relating to the surveys have been marked accordingly. The Conference also revised the tentative marketing survey programme drawn up by the Agricultural Marketing Adviser by reducing the number of commodities to be dealt with and postponing the reporting date in a number of cases.

Provincial Marketing Officers agreed to submit reports according to the revised time-table. The number of reports received up to date will be seen from the latest monthly Marketing Notes for June (to be circulated at the meeting) (not printed).

It has not been found possible to complete any all-India reports for circulation to the Advisory Board in time for this meeting. The Agricultural Marketing Adviser hopes, however, to have preliminary drafts for the Cattle, Milk, Wheat, Linseed and Tobacco reports available for the consideration of the expert stock-taking committees.

In connection with headquarters work on grade standards an informal conference between representatives of certain Grain Trade Associations and Millers and the Central Marketing Staff was held at Delhi on 6th April, with a view to eliminating the differences which exist between standards and contract terms obtaining in the more important grain markets of India. Copies of the proceedings (not printed) have been circulated to the Board for information.

Certain points arising out of the proceedings have been referred to the Wheat Committee for consideration. The various Associations represented at the Conference have been asked to say how far they would be prepared to modify their present contracts in conformity with the suggestions put forward at the Conference.

APPENDIX XXX.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 10th June 1936, on Subject No. 27 :—All-India Marketing Survey Reports.

At its meeting held at New Delhi on the 12th February 1936, the Marketing Sub-Committee of the Advisory Board recommended that any all-India marketing survey reports which were ready, particularly those for milk and cattle, should be submitted to the next meeting of the Board and be available for the information of the sub-committees appointed to consider the draft *briefs* for Experts in connection with the scientific survey of the work in progress and contemplated under the auspices of the Imperial Council of Agricultural Research. It was also suggested that in view of the practical difficulties which had been brought to light in the course of discussion it was desirable that the Marketing Adviser should, at some convenient date, convene a Conference with the Provincial Marketing Officers, to discuss the possibility of simplifying the procedure. The Board adopted this recommendation.

2. The Agricultural Marketing Adviser to the Government of India accordingly convened a Conference of Provincial Marketing Officers in April last. A copy of the Proceedings of the Conference is enclosed (not printed). It was agreed at the Conference that the outstanding local survey reports from the Provinces and States should be submitted by the end of May 1936. But so far 17 local survey reports have not been received for milk. (8 being from the Provinces and 9 from major Indian States and Minor Administrations), and 11 local survey reports are still outstanding in respect of cattle (5 from Provinces and 6 from Indian States). These reports will not, therefore, be ready in time for circulation to the Advisory Board meeting. It is, however, still hoped that copies of *draft* preliminary all-India reports in respect of Cattle, Milk, Wheat, Linseed and Tobacco, may be placed on the table for the information of members.

APPENDIX XXXI.

Report of the Marketing Sub-Committee of the Imperial Council of Agricultural Research at Simla on the 14th and 17th July 1936.

The following were present :—

1. Sir BRYCE BURT, KT. *Chairman.*
2. Mr. R. G. ALLAN.
3. Rao Bahadur D. ANANDA RAO.
4. Mr. E. J. BRUEN.
5. Dr. W. BURNS.
6. Dr. J. K. DUBEY.
7. Khan Bahadur Maulvi FATEH-UD-DIN.
8. Mr. M. R. FOTUDAR.
9. Mr. H. C. JAVARAYA.
10. Mr. W. J. JENKINS.
11. Mr. A. M. LIVINGSTONE.
12. Mr. J. C. McDOUGALL.
13. Mr. K. McLEAN.
14. Sir C. V. MEHTA.
15. Dr. S. K. MITRA.
16. Mr. A. M. MUSTAFA.
17. Col. A. OLVER.
18. Mr. P. PILLAI.
19. Diwan Bahadur T. RAGAVIAH.
20. Mr. P. B. RICHARDS.
21. Mr. C. B. SAMUEL.
22. Mr. D. R. SETHI.
23. Dr. F. J. F. SHAW.
24. Mr. G. T. TAIT.
25. Mr. A. M. THOMSON.

The following also attended :—

Mr. KARTAR SINGH.
Mr. D. N. KHURODY.
The Pattagar of Palayakottai.
Mr. R. WATSON.

Agricultural Marketing Progress Report (Subject No. 26 of the Agenda). (Appendix XXIX.)

All-India Marketing Survey Reports. (Subject No. 27 of the Agenda. (Appendix XXX.)

The Agricultural Marketing Adviser informed the Committee that so far as wheat, linseed, tobacco, cattle and milk were concerned some

Provinces and States had not yet submitted their marketing survey reports but that rough drafts of all-India reports for these commodities had been prepared. A meeting of the Provincial Marketing Officers had also been convened in accordance with the recommendation of the last marketing sub-committee to discuss, among other things, simplification of procedure and allocation of work between Central and local Marketing Staffs. This had been done in the case of the new commodities selected for survey this year.

2. The Delhi Marketing Survey Reports had been circulated to the local Marketing Staffs and copies thereof were also available for consultation by members.

3. The Chairman referred to the note circulated on the subject of the supply of railway statistics to marketing staffs. The Committee recommended that the Advisory Board should pass a resolution appreciating the fact that the Railways were prepared to give to the Marketing Staffs the available statistics, but regretting the position taken up by the Railway Board in regard to the payment for the collection and compilation of extra statistics. Also that the Advisory Board, in view of the fact that this was a matter which affected the Railways very closely, should recommend to the Railway Board to request their Agents to consider favourably any applications for extra statistics so long as the cost did not exceed, say, Rs. 500 per annum in each case.

4. The Agricultural Marketing Adviser also referred to the meeting of the Central Marketing Staff with some representatives of the grain trade and said that certain points arising out of those proceedings had been placed before the wheat sub-committee and would be reported to the Advisory Board.

Annual Reports for 1935-36 on Provincial Marketing Schemes. *(Subject No. 28 of the Agenda). (Appendices XXXII and XXXII-A.).*

The Committee considered the annual reports submitted by certain Provinces and recommended that all Provinces should submit annual reports giving a brief account of the work done during the year and that the individual reports should not normally exceed 6 pages of royal octavo size in print. The reports should be for the calendar year and should be submitted by the 15th January so as to enable them to be published along with a corresponding summary of the work of the Central Marketing Staff in time for the Advisory Board meeting February following.

2. The Committee agreed that there was no objection to draft marketing survey reports being supplied to Provincial Marketing Boards where they existed, *e.g.*, in Madras, for amplification and criticism by the members in a personal capacity and not as a basis for any action on the part of the Board.

Need for additional funds for the marketing schemes in the Provinces. *(Subject No. 29 of the Agenda). (Appendices XXXIII to XXXIII-H.).*

In introducing the subject the Chairman said that representations had been received from certain local Governments for additional staff and funds. In some cases it was proposed that this should be done by

re-appropriation within the existing sanctioned grant and in other cases an increase in the allotment of funds was sought. He said that it was clear that we could not expect the Government of India to increase the grant beyond 10 lakhs for provinces nor was there any possibility of the Governing Body agreeing to allocate research funds for marketing. As the need for additional staff was, however, at present being keenly felt, the position could be met if the Provinces were prepared to sacrifice something at the end of the period and make provision for additional staff at the moment when pressure was greatest.

2. It was pointed out by certain members that the task of local marketing officers was proving very heavy because the surveys for the last year were not yet fully complete, local marketing staffs were concentrating on writing reports and at the same time were expected to commence new surveys. After discussion the Committee recommended that the reports for the commodities undertaken last year should be carefully checked and completed so as to indicate the lines on which advance could be made. Attention should first be concentrated on getting out the wheat, linseed, tobacco, cattle, milk and egg reports and that the reports on rice, groundnuts, bananas, grapes and hides and skins should follow. The Chairman said that it was not proposed to confine attention to investigation work only throughout the whole period but that as soon as the surveys on the first set of commodities were completed, development work for those commodities should follow. This would of course slow down the investigation work on other commodities. He, however, emphasised that seasonal information should be collected by local marketing officers so that the reports on the remaining commodities might not be unduly delayed.

3. After discussion, the Committee decided to recommend that the utmost elasticity compatible with the main scheme should be exercised in cases of (*a*) reappropriations within a year and (*b*) reappropriations from year to year, provided the total grant to each Province for the whole 5-year period was not exceeded. Further, that the Vice-Chairman, Imperial Council of Agricultural Research, might immediately sanction any proposals submitted by local governments for temporarily augmenting the present staff, provided that the services of the Assistant Marketing Officers were retained throughout and that the extra cost involved was met by subsequent savings.

4. The Committee recommended the approval of the following proposals submitted by certain local Governments which conformed with the foregoing principles.

(*i*) Bihar and Orissa—as submitted.

(*ii*) Madras—a scheme for the replacement of one upper division clerk by 2 typists.

(*iii*) Punjab—as submitted, and

(*iv*) Central Provinces—as outlined by Mr. McDougall.

5. The Committee recommended also that, subject to their being brought into conformity with the above principles, both of the proposals from Assam, *viz.*, for the appointment of a temporary Assistant Marketing Officer and for additional temporary establishment and the proposals

from Madras for the appointment of agricultural demonstrations and those from Bombay for the addition of *dalal's* assistants to the marketing staff should be approved and that the local Governments be informed accordingly.

6. Mr. Fotudar drew attention to the fact that Kashmir Marketing Board had not received from the Council nor from the Local Government any funds for the marketing scheme. It was pointed out to him that the Government of India had given funds for the Provinces only. The Committee suggested that as Kashmir is a constituent State of the Council, that Government might consider allocating funds for the marketing scheme in the same way as other constituent States have done.

Notes on the lines of future marketing developments. (Subject No. 35 of the Agenda. (Appendix XXXIV.)

1. *Grading and Marketing.*—The Committee recommended that so far as heavy commodities like wheat, rice, linseed, and groundnut were concerned, grades and standards should be controlled by suitable trade associations which should have statutory recognition. Control by trade associations would, however, not be so appropriate in the case of perishable commodities like fruits, eggs, butter, etc., and that so far as these commodities were concerned experimental packing and grading-stations should be set up to grade and mark the produce and to work out standardised containers and methods of packing. In the first instance these might be financed from funds available for "Headquarters work on grade Standards". The producers, processors and packers running such packing-stations should be registered.

2. *Registration of Markets and Slaughter-houses.*—The Chairman suggested that instead of legislation a handbook of markets and slaughter-houses showing the name of the controlling authority in each case and the nature and amount of market charges, etc., might be compiled and published for the information of producers and others sending produce to these markets. After some discussion the Committee decided that the proposals in regard to this and the registration of merchants were premature and recommended that the line of action should be determined only after the marketing reports were complete.

3. *Summary of Proposed Legislation.*—The Chairman pointed out that it would have to be carefully considered how far legislation should be central or provincial and that probably most of the marketing legislation would in the long run be provincial. The Committee took the view that all-India standards would be desirable in most cases and recommended that legislation of an enabling character should be promoted for the following purposes :—

(*i*) The establishment of trade associations with statutory recognition and powers to control trading in certain commodities on the lines of the East India Cotton Association.

(*ii*) The definition of statutory standards and grades of agricultural produce and corresponding grade designations and marks—the adoption and use of such standard grades,

designations and marks to be voluntary—and for prescribing standard units of weight, size, measure or count and type of containers to be used in connection with such graded produce.

(*iii*) The registration of producers, packers, processors or manufacturers who are prepared to adopt and use the statutory grades in connection with the sale of produce.

(*iv*) The issue of regulations to give effect to the foregoing proposals and for establishing, where necessary, appropriate committees of producers and traders to advise on matters affecting their interests.

4. With regard to the registration of markets and slaughter-houses, the Committee recommended that on the publication of the marketing survey reports the present position in regard to the control of markets under Municipal Acts and bye-laws should be ascertained from local

B. C. BURT,

APPENDIX XXXII.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 12th June 1936, on Subject No. 28, (i), (ii), (iii) and (iv), Annual Reports for 1935-36 on Provincial Marketing Schemes.

(*i*) Madras.

(*ii*) Bihar and Orissa.

(*iii*) Burma.

(*iv*) Sind.

The annual reports mentioned above are enclosed, (Annexure I—IV). These will be considered in the first instance by the Marketing Sub-Committee whose personnel is given below :—

1. The Vice-Chairman, I. C. A. R.
2. The Agricultural Expert, I. C. A. R.
3. The Animal Husbandry Expert, I. C. A. R.
4. The A. M. A. to the Government of India.

5—16. All provincial Directors of Agriculture.

17. Mr. E. J. Bruen, Live-stock Expert to the Government of Bombay.

18—20. 3 Senior Marketing Officers.

21. Sir C. V. Mehta, K.C.S.I.
22. Diwan Bahadur T. Raghaviah, C.S.I.
23. Secretary, Imperial Council of Agricultural Research, *Secretary (ex-officio.)*.

The sub-committee's report (*Appendix XXXI*) will be circulated to the Board in due course.

ANNEXURE I.

Annual report on the Madras Agricultural Marketing Scheme for the year 1935-36.

M. R. Ry. K. Gopalakrishna Raju Garu was appointed as the Senior Provincial Marketing Officer, his pay, etc., and that of his establishment being met by the local Government.

2. With the fund provided by the Imperial Council of Agricultural Research, three Assistant Marketing Officers and their establishment were appointed towards the end of February 1935. The Assistant Marketing Officers joined duty on the dates noted below :—

M. R. Ry. K. W. Chakrapani Marar	.. On 25th February 1935
M. R. Ry. S. N. Venkataramanan	.. On 21st February 1935.
M. R. Ry. M. P. Kunhi Kutty	.. On 23rd February 1935.

3. At the joint conference of the Provincial Marketing Officers and the Central Marketing Staff held at Delhi in March 1935, it was decided

to include in the scheme of marketing surveys all the important agricultural products, but to ensure thoroughness, the surveys were to be confined to commodities of all-India importance, *viz.*, rice, wheat, groundnut, linseed, tobacco, fruits, milk, and milk products, cattle, eggs, hides and skins. It was also decided at the conference that the marketing staff should concentrate on the marketing survey of the crops and that development work like the formation of marketing organisations, etc., be deferred until the results of the survey were available as a sound basis to proceed.

4. The distribution of work among the Marketing and Assistant Marketing Officers were as follows :—

Provincial Marketing Officer.—

(*i*) Marketing survey of rice in the Presidency.

(*ii*) Supervision and control of the surveys of commodities allotted to the Assistant Marketing Officers.

(*iii*) Direct charge of special and local marketing problems in respect of commodities not included in the programme of the first year.

(*iv*) Provincial Marketing Board and work connected therewith.

Assistant Marketing Officer Mr. K. W. Chakrapani Marar.—Marketing survey of groundnut, linseed and wheat.

Assistant Marketing Officer Mr. S. N. Venkataramanan.—Marketing survey of tobacco and fruits (oranges, apples and bananas).

Assistant Marketing Officer Mr. M. P. Kunhi Kutty.—Marketing survey of eggs, milk and milk products, live-stock (cattle and buffaloes), hides and skins.

5. The main lines fo investigation in respect of the commodities mentioned above were as follows :—

1. *Supply* ..	.. Production, imports, exports, season of marketing, etc.
2. *Demand*	.. For export and local consumption, quantitative and qualitative, seasonal variations and trends.
3. *Wholesale prices* ..	.. Trends and periodicity in prices, market intelligence, etc.
4. *Preparation for market* ..	.. Methods of harvesting, cleaning, processing, costs, etc.
5. *Assembling*	.. By producers, village merchants, wholesale merchants, finance of assembling, function of banks and Co-operative Societies.
6. *Grading and Standardisation*	.. Possibilities of grading the produce and standardisation of contracts.
7. *Conservation*	.. The present methods of storage at producers' holding, wholesale market mills, and ports and possibilities of improving storage facilities.

8. *Handling and transportation*	.. At ryots' holding, rail head, market and port—methods and cost.
9. *Distribution of produce* ..	.. Wholesale and retail by producers, village merchants, wholesale merchants and exporters, etc.
10. *Processing and distribution of products.*	Possibilities of further developments.
11. *Seed*	.. Present methods of supply and distribution of seed, and further possibilities of improved seed production and distribution.
12. *Weights and measures* ..	.. Customary units of sale in different districts.

6. Even at the first conference of the Marketing Officers it was pointed out that the programme was too ambitious and that the proposed surveys were too comprehensive to be completed in the allotted time with the limited staff available for the work. The monthly progress reports of the Marketing Officers were sent regularly to the Agricultural Marketing Adviser to keep him in touch with the progress of work. The Marketing Staff visited several centres of production and consumption, interviewed over thousand persons engaged in the production, manufacture and distribution of the commodities included in the year's programme. The types of persons, who were enquired, included producers, village merchants, wholesale merchants, railway, municipal and port officers, mill owners, retailers and banks and Co-operative Societies, etc.

7. In addition to the marketing surveys of the commodities mentioned above, information was also collected for the reports on fairs, markets and produce exchanges and co-operative marketing of agricultural produce. As suggested by the Agricultural Marketing Adviser the co-operation of local bodies and the district officers of the Co-operative and the Agricultural Departments has been sought in the collection of data required for the reports on co-operative marketing and fairs and markets. Copies of the synopses relating to these subjects were circulated, and the replies are being received.

8. The railway statistics on the movements of commodities required for the marketing survey were collected and compiled from the registers maintained at the Head Offices of Madras and Southern Mahratta and South Indian Railways. This was found to be a laborious work and took considerable time of both the executive and the clerical staff. Crop and live-stock maps showing the distribution by districts and taluks in the Presidency in respect of all commodities surveyed in the year were prepared and sent to the Marketing Adviser.

9. The final reports on the marketing survey of wheat, linseed and eggs have already been submitted. The notes of survey on groundnuts, rice, tobacco, fruits, cattle, milk, hides and skins are being compiled, and the final reports are expected to be ready in a month's time.

10. For work in connection with grade standards, samples of the following commodities were collected from different market centres in

the Presidency and sent to the respective officers engaged in the analytical work.

	Number of samples collected and sent so far.—
1. Rice and Paddy	368
2. Groundnuts	461
3. Tobacco	30
4. Hides	100
5. Genuine Groundnut Oil	5
6. Linseed Oil	6
7. Gingelly Oil	1
8. Ghee	2
9. Wheat	8
10. Linseed	4

11. *Maintenance of price records.*—When the Marketing Section began to function it was found that information was lacking on the correct prices of different commodities. Only the retail prices of some of the food grains are published once a month in the Fort. St. George Gazette. Arrangements were made immediately after the formation of the Marketing Section to obtain from the district staff of the local Agricultural Department, certain branches of the Imperial Bank of India and Chambers of Commerce, a list of weekly prices of important agricultural commodities in the important market centres of the Presidency. Weekly market rates of about 35 commodities are being received and recorded from about 65 sources since the past one year. The prices are tabulated and made use of in the preparation of price charts, etc. Proposals were made for making this information available to the public, trade associations, individual merchants, etc., by the publication and issue of weekly list of prices current. These are now under the consideration of the Pevenue Board.

12. Enquiries from producers, merchants, trade associations, co-operative societies, commercial bodies and railways on the disposal of produce, movements of commodities, and other marketing problems have been a special feature after the creation of the Marketing Section. There were over fifty such important enquiries during the year and suitable action was taken on them.

13. *The Provincial Marketing Board.*—A Provincial Marketing Board for the Presidency was constituted by the Government in August 1934, with the Director of Agriculture as the chairman, the Provincial Marketing Officer as the secretary, the Director of Industries, the Registrar of Co-operative Societies and two non-officials, as members. Four meetings of the Board were held at which several subjects of provincial importance were discussed. The programme of marketing surveys adopted at the Delhi Conference was generally approved. The following are some of the main items which engaged the attention of the Board.

(i) The Board requested the Government to take effective action as regards the prohibition of imports of foreign rice or the levy of a heavy duty thereon and for the restriction of imports of paddy and rice from Burma.

(ii) The suggestions of the Provincial Marketing Officer regarding the starting of Co-operative Marketing Societies, construction of warehouses for stocking the produce of members of such societies and the granting of short term loans on standing crops and the produce in stock were discussed, and the Government addressed in the matter.

(iii) The necessity for the standardisation of weights and measures was urged on the Government.

(iv) The local rulings as regards the regulation of prices of sugarcane for use in sugar factories under the Sugarcane Prices Act No. XV of 1934, were discussed by the Board.

(v) The question of granting special concession in railway freight for transport of plantains from the main producing centres in the Presidency to Northern India and certain other facilities for their quick and efficient transport was taken up with the Madras and Southern Mahratta and South Indian Railways with the result that the railway freights were reduced from half parcel to one third parcel rates to certain stations in Northern India like Delhi, Allahabad, Benares, Lucknow, Nagpur, etc., as an experimental measure.

14. *Finance.*—The following shows the budget allotment and amount expended in the year 1935-36 from the funds allotted by the Imperial Council of Agricultural Research. The contribution made by the local Government towards the scheme is indicated in the last column.

	Budget allotment.	Expenditure.	Contribution by the local Government.
	Rs.	Rs.	Rs.
1. Pay of Officers and Establishment	11,600	11,573	8,348
2. Allowances including Travelling Allowance ..	5,100	5,096	2,017
3. Contingencies, Supplies and Services ..	2,400	2,400	550
Total	19,100	19,069	10,915

K. G. KRISHNA RAJU,
Provincial Marketing Officer.

ANNEXURE II.

A.—Summary Progress Report of Work done by Assistant Marketing Officers in Sind in 1935-36 under Marketing Investigations.

1. Under the Marketing Investigation Scheme (All-India) financed by the Imperial Council of Agricultural Research, three Assistant Marketing

Officers have been appointed for work in Sind and their duties have been allotted as under :—

(1) Assistant Marketing Officer (Cereals) ..	..	Wheat and Rice.
(2) Assistant Marketing Officer (Special Crops)	..	Oil-seeds, Tobacco, Fruit
(3) Assistant Marketing Officer (Live-stock)	..	Milk, Eggs Hides and Skins, Cattle.

In addition to work in the Province of Sind, the Sind Marketing Staff is carrying on its investigations under the Marketing Scheme in the Indian States of Khairpur and Las-bela.

2. The initial work was the carrying out of a Survey into present marketing conditions of the various commodities mentioned above. This survey work was commenced from July 1935, for the first two groups, *i.e.*, Cereals and Special Crops and from September 1935, for the Live-stock group as the Assistant Marketing Officer (Live-stock) was appointed later than those for Cereals and Special Crops.

3. During the period under report, marketing surveys have been carried out on the under-noted commodities :—

Cereals ..	..	Wheat, Rice.
Oil-seeds ..	..	Linseed, Ground-nuts.
Special Crops	..	Tobacco.
Fruits ..	..	Oranges, Apples, Bananas, Grapes.
Live-stock, and live-stock products.		Milk and Dairy products. Poultry and Eggs. Hides and Skins (including Furs and Fancy skins). Cattle (Oxen and Buffaloes).

4. Survey work commenced at the main centres of production and continued through the main channels of distribution and sale to the terminal markets, *e.g.*, Karachi and the chief consuming centres. For each commodity under investigation, replies to model questionnaires and schedules were collected from numerous representatives of all groups connected with the production, distribution and sale or consumption of that commodity and from all such sources as merchants, traders, industrial concerns, export and import agencies, railways, etc., connected with the marketing or transport of the commodity under investigation. The Assistant Marketing Officers conducted a series of tours throughout the Province of Sind and visited the large trading and industrial centres where the required information was collected by personal interviews and enquiries. Samples of the commodities under investigation were collected whenever possible and photographs were taken to illustrate the existing practices in handling, grading, storage, transport and sale. Marketing atlases showing the distribution of the production of the various groups of commodities under investigation and statistical tables of production, movement, distribution and consumption were prepared.

During the year, the survey work on all the commodities mentioned in paragraph 3 above has been completed and the final survey reports on

the under-noted of these commodities have been submitted to the Marketing Expert of the Government of India, who is directing and co-ordinating all the work of the Marketing Staffs in the Provinces :—

Wheat	16th April 1936.
Tobacco	20th March 1936..
Potatoes	..
Linseed	14th April 1936.
Linseed (supplementary)	15th April 1936.
Eggs	21st April 1936.
Hides and Skins	21st November 1935.
Cattle	9th April 1936.
Rice	21st April 1936.
Ground-nuts	16th April 1936.

ANNEXURE III.

REPORT ON THE BURMA AGRICULTURAL MARKETING SCHEME FOR THE YEAR ENDED 31ST MARCH 1936.

In accordance with plan the Markets Section has been engaged throughout the year solely in carrying out surveys. No development work has been attempted.

For the survey work an introductory note was prepared early in the year setting out the production, export and import position of the agricultural commodities of main importance to the Province. This has been sent forward for publication.

From the introductory note a list of subjects for survey was drawn up. This list had subsequently to be modified to make room for subjects scheduled by the Agricultural Marketing Adviser for the all-India surveys which are being compiled by the Central Staff from provincial reports.

In its modified form the list comprised the following subjects :—

Rice	Tobacco	Cattle.
Wheat	Oranges	Hides and Skins.
Ground-nut	Apples	Milk.
Linseed	Bananas	Eggs.

Surveys on all of these except " Cattle " have been submitted to the Agricultural Marketing Adviser to the Government of India during the year.

It is felt however that the 10 months allotted for completion of these surveys was insufficient and that information collected over a single season is likely to give an incomplete and possibly inaccurate picture of the conditions under which marketing is carried out. In submitting the reports therefore the suggestion has been made that before these reports are used a further season be given for checking over and amplifying the

material contained in them. In view of the fact that these surveys are intended to provide the material for an examination of the whole question of marketing improvement it is felt that too much care cannot be given to ensuring that each presents a balanced picture of the commodity with which it deals, and that the accuracy of the information contained in them is beyond dispute.

Along with the survey work done the following samples have been collected :—

Tobacco	23
Ground-nut	55
Ground-nut and Sesamum oil	20
Rice and paddy	176
Hides and skins..	101
Total ..	375

These have been sent forward for qualitative examination with a view to formulating grade standards.

The year's work has brought to light many difficulties in the way of carrying out the surveys. Prominent amongst them, so far as the majority of the commodities are concerned, is the absence of accredited associations of producers, processors, etc., to whom one could go for authoritative information.

In their absence recourse has had to be made to the interrogation of individuals. This is time-consuming, and particularly so when the person questioned, being totally unable to see any benefit to himself from the questioning (and often with definite suspicions of enhanced income-tax or the betrayal of trade secrets to a rival) fobs one off with whatever answer seems likely to release him from further enquiry.

The staff of the Markets Section has undergone no changes during the year other than the recruitment of one clerk to fill a post sanctioned at the inception of the scheme.

All have worked well under what have often been very exacting conditions.

F. D. ODELL,
Provincial Marketing Officer,
Burma, Rangoon.

The 3rd April 1936.

ANNEXURE IV.

ANNUAL REPORT OF THE BIHAR AND ORISSA AGRICULTURAL MARKETING SCHEME FOR THE YEAR 1935-36.

It is generally admitted that the marketing of agricultural produce in this country is in an unorganized state. It has to be properly organized and developed if the position of Indian agricultural produce has to be

strengthened in the world markets and greater advantage taken of the huge internal markets for such produce. Organization, however, requires accurate and exact knowledge of details as surely as development requires capital. With a view, therefore, to study the different aspects of agricultural marketing in detail and to develop the marketing of agricultural produce, a scheme of agricultural marketing survey was inaugurated by the Imperial Council of Agricultural Research with effect from 1st January 1935. The Bihar and Orissa scheme forms a part of the all-India scheme and is worked as a section of the Department of Agriculture but under the technical advice and guidance of the Agricultural Marketing Adviser to the Government of India. The Imperial Council of Agricultural Research finances the scheme, the Local Government contributing the pay and travelling allowance of the Senior Marketing Officer. The Provincial Marketing Office was started on the 11th March 1935. I joined as Senior Marketing Officer on the 13th March and the Junior Marketing Officers joined in the end of May or beginning of June 1935.

Staff.—The staff of the Agricultural Marketing section consists of :—

Senior Marketing Officer-in-charge ..	Mr. B. N. Sarkar.
Junior Marketing Officer	Mr. P. R. H. Acharjee. (Cereals group).
Junior Marketing Officer	Mr. P. C. Varma. (Special Crops and Hides and Skins).
Junior Marketing Officer	Mr. M. H. Jani, (Live-stock group).

The office establishment consists of four clerks and a tour clerk besides peons and orderlies.

Plan of Work.—It is intended to carry out a complete survey of marketing of all important agricultural produce in due course. For the first year it was decided to take up ten commodities of all-India significance, *viz.* :—

1. Rice.
2. Wheat.
3. Ground-nuts.
4. Linseed.
5. Tobacco.
6. Fruits (Citrous and Deciduous fruits and bananas).
7. Hides and Skins.
8. Cattle (Oxen and buffaloes).
9. Eggs.
10. Milk.

It was also decided to carry out at the same time a survey of markets, fairs and *hats,* of co-operative trading societies, and to investigate the question of suitable containers as well as technical matters relating to quality grading and standardization of commodities. The survey was to be carried out by visiting as many places of production and trade as was possible within the time allowed and interviewing a number of persons engaged in the production, assembling and distribution of each commodity.

General Condition.—The production of crops in Bihar and Orissa varies greatly with the different climates and soils in the different tracts. Bihar proper, being a part of the Gangetic valley and lying midway between the dry wheat tracts of Northern India and the wet rice lands of Bengal, maintains a high standard of agriculture which supports a heavy population. Chota Nagpur is a hilly tract, inhabited mostly by backward people, where cultivation is much inferior to that of Bihar. Parts of Western Orissa present conditions similar to those in the Central Provinces, while the greater part is a deltaic strip of country bordering the Bay of Bengal where excellent crops of rice are obtained in years when floods do not destroy it. Barring a few planters in North Bihar, cultivation by peasant proprietors with small fragmented holdings is the rule. The average holding is estimated to be 5 acres per household in Bihar, 11¾ acres in Chota Nagpur and 9 acres in Orissa. The province grows in a more or less extent almost all the crops that are grown in India and supplies other provinces with many of their necessities, while such products as pulses, oilseeds, lac and hides and skins find a world market. There is little or no organized effort on the part of the cultivators in the marketing of their produce. Cultivators sell their produce individually to the *baparis* who bring it to the wholesale markets and then it goes on changing hands till it reaches the consumer. There is practically no standard of weight, quality or method of business, the whole thing is a scramble of little men for profits anyhow.

Work done during the year.—The survey of all the commodities taken up was carried out and preliminary reports on linseed, ground-nuts, wheat, tobacco, eggs, pineapples and grapes were submitted before the 31st March 1936. Reports on cattle, rice, milk, bananas and hides and skins are under preparation. The surveys of mustard, barley, gram, mangoes, lichies, potatoes, fish, sheep and goats and butter and ghee were taken up at the end of the year under report.

In respect of marketing enquiry this province stands at a disadvantage in comparisón with other provinces because, due to the Permanent Settlement no village papers are maintained with regard to acreage production, price, etc. ; there is no organization for enquiry in rural economy or for the marketing of some important crops as there are in other provinces. There is not even a well organized merchants' association which keep records of stock, arrival, price, etc. Under such circumstances real difficulties were experienced in obtaining accuate information on prices, quantities and qualities of the produce handled, internal consumption, etc., and we had to obtain these informations from individual producers and merchants as best as we could.

During the course of the survey it was found that weights and measures, which form the basis of purchase and sale of agricultural produce, varied from place to place, so much so that four or five systems of weights were found to be prevalent in almost every district of the province. Then again there was no guarantee that the ratios between the different systems were maintained in the actual weights used. Enquiry showed that it was rare to find a constant ratio between any two systems. Nothing better could be expected because the units of weight are frequently a certain number of 'Gorakhpuri' pice which are just pieces of copper cut from bars without any definite shape or size or weight. Also

the materials used for weights are frequently pieces of stones of any size and shape and there is no effective check on the weights used in the village markets. Under such circumstances price quotations for each market in terms of the rates prevailing at terminal markets involve mathematical calculations too intricate to be understood by ordinary cultivators even if they knew the prevailing rates at the terminal markets. A careful enquiry has therefore been made into the systems of weights and measures in use in the province with a view to see the possibilities of regularizing, if not standardizing, the weights. The question is rather difficult due to long established customs and to the natural suspicion with which the village people view any proposal for change. For example, agricultural labour is generally paid in kind as so many seers of grain per day by the local weight. It will not be easy to convince them that they may get the same quantity even though the number of seers by the standard weight may be less. A note on the subject is under preparation for submission to the Local Government as it forms no part of the programme of all-India work.

Through the courtesy and co-operation of District Officers it has been possible to collect with the help of the *thana* officers a mass of useful information on markets, fairs and *hats*. These are awaiting compilation.

A list of important wholesale dealers in grains and other commodities operating in this province has been prepared. This list together with the information on markets, fairs and *hats* will, it is expected, make a useful directory of agricultural marketing for this province. At present there is no commercial directory of any sort for this province and I badly felt the want of one when I started my work. But this again is no part of the all-India programme and the material when compiled will be submitted to the Local Government.

With the help of the District Supervisor of Economic Enquiry work, a record was kept of the food grains actually consumed each day for the month of September 1935 in fifty families in five villages of the Patna district. This may give us some idea of the consumption of food grains in the district generally.

It is yet too early to outline any scheme of development as the survey is not yet complete and all the relevant facts have not yet been collected and submitted to the Agricultural Marketing Adviser to the Government of India who will ultimately plan and direct the work of organization and development. The year's work, however, has shown certain features of marketing and indicates some possible lines along which improvements in the marketing of agricultural produce may be effected so far as this province is concerned.

1. *Weights and Measures*.—It has already been mentioned that the systems of weights and measures prevalent in the province are in a hopeless state of confusion. It will be difficult to put agricultural marketing on a sound basis if the weights and measures are left alone as they are.

2. *Marketing of Clean Produce*.—Enquiries supported by analyses of a large number of commercial samples of linseed, wheat, etc., have shown that the quantity of 'refraction' (dust, dirt, etc.), present in the marketed produce varies from about 3 per cent to 20 per cent. The producer thus gets his price reduced not only for bad quality but also by

an amount equivalent to the cost of carrying to and cleaning the dust at the terminal markets where labour is dear and godown rent is high. The cultivator can easily clean his produce better, but more often than not he finds that it does not pay him to do so. He feels that the *bapari* will in any case cheat him in weights so he retaliates, though often unsuccessfully, by putting in dust and dirt. Due to the absence of any standard for quality or for weight it often becomes a competition between the producer and the *bapari* as to who can cheat the other most. Evidences were also not wanting to show that the *baparis* put in dirt, etc., after they had purchased the produce from the cultivators. Grades and standards of quality are therefore a necessity. Such grades and standards, however, will have to be worked from the top downwards. Big exporting firms and merchants must insist on quality grades. Action on the part of a few cultivators here and there is of no avail in this respect, because no premium is or can be offered to a few sellers of very small lots. The *bapari* has to mix it up with other lots as he goes on buying and the whole-sale merchant has to incur the cost of cleaning as usual, a few maunds making no difference in his godown where hundreds of maunds have to be dealt with.

3. *Market Quotations.*—Some arrangement should be made to bring to the notice of producers information on prices prevailing at the terminal markets. Market places and railway goods sheds are convenient places for the circulation of such information. Spread of information on market quotations at standard weights and for standard grades will go a long way in popularising the standard weights as well as quality grades.

4. *Confusion in the movement of produce.*—Due to lack of market intelligence nearest buyers and sellers do not always come together to trade. The result is unnecessary movement of produce. It should be possible to bring about an organisation, official or non-official which will act as a clearing house of information on supply and demand, areas of surplus production and deficient areas, etc. Such an office when organized should also collect and publish market intelligence on stocks, arrivals, prices, etc., for which there is no arrangement at present. The collection of these facts at regular intervals is essential for development of marketing.

5. *Market charges.*—Enquiry has revealed considerable variations in the charges realised by *aratias* from buyers and sellers in different places. It is desirable to examine the possibilities of regulating the charges. A more thorough and detailed enquiry is, however, necessary before any proposal can be formulated in this respect.

Commercial samples of all the commodities were collected and sent to different Research Institutes for analysis as arranged by the Agricultural Marketing Adviser. In all, 473 samples were collected and despatched.

This section took part in the Departmental show at the Provincial Exhibition held at Patna in February 1936. The different systems of weights and measures prevalent in the province were shown by actual exhibits as well as by charts and diagrams. The aims and objects of the marketing survey were explained to the visitors.

During the year, myself and my staff were on t ur for 778 days in all. 569 places were visited and 1,133 persons were interviewed.

The marketing staff was called on to carry out marketing survey in the twenty-six Indian States lying within the boundary of Bihar and Orissa. But our hands were too full to enable us to take up work in the States. Orders have been received for the appointment of a temporary Assistant Marketing Officer for surveying the markets in the States.

The Agricultural Marketing Adviser to the Government of India inspected our work on the 30th of November 1935. All the members of the Central Marketing Staff visited the province in the course of the year.

The total expenditure incurred during the year is shown in the attached statement.

Statement showing the expenditure out of the Funds of the Imperial Council of Agricultural Research on account of Marketing scheme, Bihar and Orissa, for the year 1935-36.

	Rs.	A.	P.
Pay of Junior Marketing Officers, Bihar and Orissa	5,477	7	0
Travelling Allowance of the Junior Marketing Officer, Bihar and Orissa	3,287	12	0
Additional Travelling Allowance of Senior Marketing Officer, Bihar and Orissa ..	723	4	0
Pay of Office establishment	2,968	2	0
Contingencies	1,752	6	3
Hire of Office	541	15	0
Total ..	14,750	14	3

APPENDIX XXXII-A.

Supplementary note by the Secretary, Imperial Council of Agricultural Research, dated the 25th June 1936, on Subject No. 28 (v) :— Annual Reports for 1935-36 on the working of the Economics and Marketing Section of the Central Provinces Department of Agriculture.

The annual report mentioned above is enclosed. (Annexure.) This will be considered in the first instance by the Marketing Sub-Committee along with the other reports circulated with subject No. 28 of the Agenda. The report of the sub-committee (*Appendix XXXI*) will be circulated to the Board in due course.

ANNEXURE.

REPORT OF THE WORKING OF THE AGRICULTURAL DEPARTMENT ECONOMICS AND MARKETING SECTION FOR THE YEAR ENDING 31ST MARCH 1936.

The marketing staff was appointed in February 1935 in accordance with Government of India's resolution No. F.-16, M.-1934 and the Assistant Marketing Officers with the aid of draft synopses commenced market survey work almost immediately. At the Conference of Provincial Marketing Officers held in Delhi a month later, draft synopses, as well as the items concerning procedure were discussed, and copies of the proceedings were published in May. At this Conference it became evident, in view of the absence of certain statistical data and the small provincial staff engaged in the surveys, that considerable difficulties would be encountered and that in forming estimates regarding some commodities such as eggs, considerable judgment would have to be exercised. The Agricultural Marketing Adviser to the Government of India explained, however, that as time was one of the most vital factors in marketing, we could not wait until precise statistics were compiled and that in any case academic precision was not necessary to enable us to come to sound general conclusions, or to put up specific proposals for the better marketing of a particular commodity.

These surveys are therefore designed to furnish such information as will permit of a fairly accurate and representative picture being drawn regarding current market practices, trends of production and prices, and the ebb and flow of supplies. To obtain such information the investigators have had to follow the product along recognised market routes from the producer to the consumer or until it passed out of the province, and to keep in close touch with the different units in the whole distributing chain.

2. In April, I proceeded on 7½ months' leave and resumed duty as Deputy Director of Agriculture, Economics and Marketing on my return in December. During my absence Mr. Mehta, Extra Assistant Director held charge of the office of Economics and Marketing in addition to his own duties as Assistant Marketing Officer in charge of Oil-seeds and Mr. Gadre, Agricultural Assistant, Southern Circle was temporarily posted to the section to carry out enquiries regarding fruits and tobacco. As he did not join until the middle of July enquiries concerning Bananas have not yet been completed.

3. Whilst on leave I was for a time attached to the Markets Division of the English Ministry of Agriculture and Fisheries to enable me to study certain phases of marketing. I accompanied officers on their visits to

markets and packing houses and witnessed the Ministry's demonstrations at the Imperial Fruit and Dairy Shows. I also made enquiries in Covent Garden, Paris and Marseilles concerning the possibilities of marketing Nagpur oranges in England and France and submitted reports thereon to the Agricultural Marketing Adviser on my return from leave.

4. Surveys in respect of commodities agreed upon, *viz.*, Wheat, Rice, Linseed, Ground-nut, Eggs, Cattle, Milk, Hides and Skins, Tobacco and Fruits, were carried out during the year and reports on Tobacco and Wheat submitted. Other reports are in preparation.

Considerable difficulty has been experienced in obtaining statistics and it is suggested that as a preliminary to any organised marketing in the future, immediate steps should be taken to obtain reliable statistical returns from all Municipalities and Local Bodies on approved forms concerning daily market arrivals and rates of each commodity. Such classified records have been maintained in a suitable form by the Malkapur Municipality for a number of years, so the argument that much more time and expense would be involved does not hold good if a simple system of recording is adopted. Such records should be valuable to market committees who are naturally interested to know how their market stands in comparison with others and if the volume of business is on the increase or decrease and as a pointer to show what steps should be taken concerning improvements—for to know the cause of trouble is more than half the cure. Legislation with regard to weights and measures is also urgently needed.

In January 1936, the Nagpur District Co-operative Growers' Association became a registered body and their first waggon-load of fruit was despatched to Delhi on the 10th March. Thanks are due to the Central Marketing Officer in charge of fruit for his assistance concerning its disposal. In future a certain sum will have to be ear-marked to cover certain losses which are certain to occur as a result of the combined opposition of *dalals*. I understand that recently the *dalals* of Peshawar subscribed Rs. 20,000 to oppose a Government marketing scheme there. This procedure would however not be necessary in Nagpur. At present the orange markets are in the hands of a few *dalals* who practically control the whole business, since they function as market auctioneers, merchants and in some cases money lenders. If a *dalal*, as a buyer, should make no profit on a consignment (which is rare) due to unfavourable rates he is assured of at least Rs. 100 per waggon-load in the form of *dalali* and perquisites. He is thus in an unassailable position with regard to competition. I suggest that the Local Government should take over control of the Nagpur and Katol orange markets and so cut out the malpractices which place the *dalals* in such a highly favourable position as to break any Growers' Co-operative scheme.

5. Cold storage experiments of Nagpur oranges carried out during the year at Poona show that ripe oranges can be stored in good condition for three months at 40°F.

Consignments were again forwarded to Kirkee in March for further trials in the current year.

R. H. HILL,
Deputy Director of Agriculture,
Economics and Marketing, C. P., Nagpur.

APPENDIX XXXIII.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 4th June 1936, on Subject No. 29 :—Need for additional funds and staff for the Marketing Scheme in the Provinces :—

(i) Representation from the Government of Madras.

Attention is invited to the attached copy of letter No. 167-Ms., dated the 4th February 1936, from the Government of Madras (Enclosure I) forwarding an application (Enclosure II) containing proposals for additional staff required for the local marketing scheme. The extra cost involved is Rs. 67,000 which the Madras Government desire the Council to provide. The application was received too late for consideration at the last meeting of the Board held in February 1936, and in the meanwhile the Government of Madras have been addressed, *vide* letter No. F. 51 (12)|36|G., dated the 20th April 1936 (Enclosure III). A reply is still awaited and will be circulated to the Board as soon as received.

ENCLOSURE I.

COPY OF LETTER FROM THE GOVERNMENT OF MADRAS, TO THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, NEW DELHI, No. 167-Ms., DATED FORT ST. GEORGE, THE FEBRUARY 1936.

Madras Marketing Scheme—Additional Staff.

I forward a copy of a letter from the Director of Agriculture, Madras, R. O. C. No. A.-999-35, dated 8th November 1935, containing the proposals for additional staff required for the Marketing Scheme of the Imperial Council of Agricultural Research. The additional staff asked for is mainly for survey work and the extraneous development work referred to in paragraph 2 of your letter No. D.-5830-35-G., dated 13th December 1935, is not being done by the Assistant Marketing Officers paid from the Council's grant but is attended to only by the Provincial Marketing Officer. During the past few months such extraneous work has been gradually curtailed. The Local Government consider that the additional staff asked for is essential if the programme of survey is to be carried through within the prescribed time limit and that if the additional staff is not sanctioned the duration of the surveys will have to be prolonged. I am, therefore, to request that sanction of the Council may be obtained to the employment of 6 Agricultural Demonstrators and 6 messengers for work on the Marketing Scheme during the period 1st March 1936 to 31st December 1939, and for an additional expenditure of Rs. 67,000 during that period as detailed in the enclosed estimate.

ENCLOSURE II.

LETTER FROM THE DIRECTOR OF AGRICULTURE, TO THE SECRETARY TO THE GOVERNMENT OF MADRAS, DEVELOPMENT DEPARTMENT, MADRAS, R. O. C. No. A.-999|35, DATED THE 8TH NOVEMBER 1935.

SUBJECT :—*Staff—Marketing Section—Proposals.*

I have the honour to address Government on the question of additional staff required for the Marketing Scheme of the Imperial Council of Agricultural Research.

2. The staff provided by the Imperial Council of Agricultural Research consisting of 3 Assistant Marketing officers is found quite inadequate for the extensive programme laid down by the Agricultural Marketing Adviser to the Government of India.

3. The work of the Marketing staff consists mainly of the following :—

(*a*) (1) Visit to villages and markets in the main centres of production and consumption and interviews with producers, merchants, manufacturers, transport and market representatives, and others regarding their practices and methods of business in connection with the marketing of each commodity.

(2) Examination and differentiation in precise technical terms of the various qualities of each product, collecting samples, describing various processes and methods of marketing, grading, packing, etc. (with photographs where necessary).

(3) A study of the movement of the produce by indicating source of supply, subsequent destination and methods of utilisation.

(4) Collecting from producers and from market authorities trade or official sources, information regarding producers, wholesalers and consumers, prices, weekly, monthly and annually, collecting also information regarding the amount and causes of price margins, differences, fluctuations and variations.

(5) Preparation of marketing statistics, charts and maps.

(6) Fixing of grades and standards for different commodities and organisation of improved marketing generally.

(*b*) Fourteen commodities have to be surveyed in the first year in the manner indicated above. The reports in regard to the Co-operative marketing of agricultural produce and on fairs, markets and produce exchanges have since been added to the already heavy programme of work for the year.

(*c*) From the programme above given it will be seen that the extent of the enquiry demanded and the amount of details called for are beyond the capacity of the staff as now provided. Further, at the time when the proposals for staff for marketing surveys were submitted, there was no idea of the time limit for the completion of the survey and the submission of the reports. It has since been decided that the surveys on the commodities taken up this year should be completed *within 10 to 12 months* from April 1935.

(*d*) Under the present arrangement every Marketing Officer in the Province has 3 to 5 commodities to deal with. As the production and distribution of each of these commodities are so widespread, and as areas of both intensive and sparse production as well as consuming areas have to be surveyed, each Officer has to cover on an average 20 to 25 districts besides the Indian States. Under the circumstances they are not able to spend much time on enquiry at any of the centres since the whole province has to be covered in a very limited time. The merchants and middlemen as a class are averse to revealing their methods and practices unless one is well acquainted with them. It was thought that the Agricultural

Staff now working in the districts would be able to render the necessary help to the Marketing Section. But in practice it has not been found always possible, and complaints have already been received that the regular work of the Demonstrators would suffer on this account.

(*e*) Besides the work under the All-India marketing programme above referred to, the marketing staff has to deal with problems of special importance in the province, which are increasing in number. As for instance, the marketing staff have had to investigate and furnish information to the Government as well as producers and merchants and co-operative societies on the marketing of commodities like potatoes, jaggery, arecanut, coriander, garlic, pepper, mangoes, plantains, other fruits and vegetables, etc. All subjects which have any little bearing on agricultural economics, or marketing are now being referred to the marketing staff both by the Director of Agriculture and other Departments of Government. These matters take up considerable time of the marketing staff, and to that extent they are not able to devote attention to the regular marketing work of the All-India scheme proper.

4. To get over the above difficulties and for completing the detailed marketing surveys in the limited time the only course is to provide additional help for the marketing section. The marketing staff will have to be strengthened by the addition of subordinate assistants entirely for marketing work. * * * * *

* * * * * * *

On detailed examination of the work in hand and the work expected to be taken up next year, I am of the opinion that the barest minimum of additional staff required will be 6 Agricultural Demonstrators. As experience is gained and work develops, the further additional staff required may be thought of. Of the 6 Agricultural Demonstrators now proposed, two will be for the Northern districts of the Presidency, two for the Southern, one for Coimbatore-Salem and the West Coast, and one at Madras. The Agricultural Demonstrators at Madras will help the Assistant Marketing Officers in collating the statistics and tabulating the data received from the districts. He will tabulate and collect information from Railways, Customs and other offices. He will also maintain price records, charts, maps, etc., and be in charge of handling and despatching samples of different commodities for analysis to enable the fixing of grade standards. The Agricultural Demonstrator at Headquarters will also be sent out occasionally to the districts to assist in works which have to be completed urgently and which require extra help.

5. An estimate of expenditure for the additional staff of 6 Agricultural Demonstrators is enclosed.

6. I request that the need for extra staff for marketing work may be urged on the Imperial Council of Agricultural Research with the full support of Government. In this connection, I wish to bring to the notice of Government that other provinces are taking similar action and that the United Provinces has definitely entered its protest against the inadequacy of the present staff. A copy of the letter No. 6318-A, dated the 5|17th October 1935 of the Director of Agriculture, United Provinces, to the Secretary, Imperial Council of Agricultural Research on the subject, is enclosed.

COPY OF LETTER FROM THE DIRECTOR OF AGRICULTURE, UNITED PROVINCES, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, SIMLA, NO. 6318-A, DATED THE 5|17TH OCTOBER 1935.

I have the honour to inform you that I have addressed every Director of Agriculture on the subject of the present marketing survey as is being attempted in the Provinces and we are unanimously of the opinion that the staff and provision made by the Imperial Council of Agricultural Research is hopelessly inadequate for the far too ambitious and extensive programme, as designed by the Chief Marketing Officer, as the work for the present or next year and that either this survey must be cut down very considerably or the Imperial Council of Agricultural Research must find money to provide assistants and more travelling allowance for the marketing staff. The programme of work, the character of the questionnaire and the added calls, such as detailed studies of railway shipments, have been drawn out without sufficient consideration of the conditions prevalent and either these demands must be modified or the staff must be strengthened to meet a programme which, though calling for about 4 years work is being attempted to be pressed into two. The results can only be unsatisfactory. Few of us are in a position, with other calls on the time of our district staff, to provide special assistants to help these officers and even the help provided by the district staff when the marketing staff visit a district is being limited in many cases, because of the character of the demand provided to the detriment of the work for which local Government provided these men.

Though I propose to bring this matter and the whole scheme, as it is now being worked, up for consideration of the Advisory Board at its next meeting, I am lodging the present protest, as on the grant of the present year. I am certain, as are other officers in charge of Provincial Departments that the marketing survey cannot be effectively done and that its only outcome will be either inadequate data or what is worse incorrect or inadequately digested and sifted data.

Staff-Additional Staff—Marketing Section—Detailed Estimates for Additional Staff of Agricultural Marketing Demonstrators.

Staff proposed.	Estimate for 1935-36.	Estimate for 1936-37.	Estimate for 1937-38.	Estimate for 1938-39.	Estimate for 1939-40 till 31-12-39.	Total.	Remarks.
1	2	3	4	5	6	7	8
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
I. PAY OF ESTABLISHMENT—VOTED.							
6 Upper Subordinates (1 at Madras and 5 in the Districts) on Rs. 85—5—120.	..	8,640	8,640	8,640	7,200	33,120	Assuming that men of seven years' standing will be appointed and they be expected to assume duties on 1st March 1936. Men of seven years' standing getting a pay of Rs. 115 on 1st April 1935. Provision is made till 31st December 1939 for the Marketing Section.
II. ALLOWANCES—VOTED.							
Travelling Allowance	875	5,100	5,100	5,100	3,825	20,000	Calculated at Rs. 75 per mensem for each of the 5 Agricultural Demonstrators in the districts and at Rs. 50 per mensem for the Agricultural Demonstrator at Madras. In the first year, extra provision at Rs. 75 each Agricultural Demonstration has been provided for transfer travelling allowance.
Other Compensatory Allowance ..	..	180	180	180	150	690	For one Agricultural Demonstrator at Madras at Rs. 15 per mensem.
Total ..	875	5,280	5,280	5,280	3,975	20,690	

Staff proposed.	Estimate for 1935-36.	Estimate for 1936-37.	Estimate for 1937-38.	Estimate for 1938-39.	Estimate for 1939-40 till 31-12-39.	Total.	Remarks.
1	2	3	4	5	6	7	8
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
III. CONTINGENCIES.							
1. Furniture	..	240	100	100	100	540	Provision has been made in 1936-37 for 1 camp table, 1 camp chair, 2 trays and two small benches for each Agricultural Demonstrator. Rs. 100 provided in the other three years for any furniture that may be required later.
2. Service Postage and Telegram charges.	30	360	360	360	270	1,380	Rs. 5 per month for each Agricultural Demonstrator.
3. Tour charges	60	720	720	720	540	2,760	Rs. 10 per month for each Agricultural Demonstrator.
4. Petty contingencies and Supplies and Services.	60	720	720	720	540	2,760	Rs. 10 per month for each Agricultural Demonstrator for miscellaneous office expenses and railway freight on samples, etc.
5. Stationery	..	200	200	200	150	750	
6. Six Messengers (Pay Rs. 12 *plus* Rs. 6 travelling allowance).	..	1,296	1,296	1,296	1,080	4,968	
Total ..	150	3,536	3,396	3,396	2,680	13,158	
Grand Total ..	1,025	17,456	17,316	17,316	13,855	66,968 or 67,000	

ENCLOSURE III.

COPY OF LETTER FROM THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, TO THE GOVERNMENT OF MADRAS, DEVELOPMENT DEPARTMENT, MADRAS, No. F.-51 (12)|36|G., DATED THE 20TH APRIL 1936.

I am directed to refer to your letter No. 167-Ms., dated the 4th February 1936, containing proposals for additional staff required in the Madras Presidency in connection with the Marketing scheme.

2. The general question whether additional staff and funds are required by provinces was discussed by a special Sub-Committee of the Advisory Board of the Imperial Council of Agricultural Research in February last, which, in view of the fact that no more funds are at present available, recommended that the matter should be deferred till the next meeting of the Board and that, meantime, the local Marketing Staffs should submit to the Agricultural Marketing Adviser the reports, as complete as possible, on the several commodities under survey strictly in accordance with the programme. This would facilitate the consideration by the Advisory Board of the applications from individual provinces for additional staff and funds or alternative modifications of the survey programme. The Advisory Board accepted these recommendations. Your letter will therefore be placed before the Advisory Board at the next meeting which will be held in July 1936.

3. It may, however, be observed that at the commencement of the Marketing Scheme it was made clear that the Central grant is not intended to cover all the expenditure on the improvement of marketing, but to provide for a nucleus staff for a specified period ; on the other hand, the general scheme contemplates that the application of the results of the marketing surveys will be largely provincial. Whilst the Council undertook to provide for three Assistant Marketing Officers in Madras, the Madras Government agreed to appoint a Senior Marketing Officer at their own expense. It was contemplated that all these officers—including the Provincial Marketing Officer appointed by the Madras Government—would be employed wholetime on the scheme as approved by the Council. From the enclosure to your letter quoted above, however, it appears that the Provincial Marketing Staff is now required to investigate and furnish information to the Local Government as well as to producers, merchants and other institutions on the marketing of several commodities such as jaggery, arecanut, coriander, garlic, pepper, etc., and which do not at present find place in the scheme. " All subjects which have any bearing on agricultural economics or marketing are now referred to the marketing staff both by the Director of Agriculture and other Departments of Government. These matters take up considerable time of the marketing staff, and to that extent they are not able to devote attention to the regular marketing work of the All-India scheme." It will be appreciated that the inclusion of such duties is not altogether compatible with the present application for additional assistance from Central funds and the Advisory Board may take the view that the cost should be met by the Local Government rather than by the Imperial Council of Agricultural Research. In these circumstances. I am to express the hope that you will be prepared to reconsider the application for additional staff involving an extra expenditure of Rs. 67,000. It is requested that the result may kindly be

communicated to this Department in good time to be placed before the Advisory Board in July next. I am to add that in providing ten lakhs towards the cost of provincial marketing staffs, in addition to providing the whole cost of the Central marketing staff, the Government of India made very substantial contribution with the object of ensuring the completeness of the all-India marketing surveys. Until the first survey reports have been completed and considered it would be entirely premature for the Council to propose further grants for provincial staff.

APPENDIX XXXIII-A.

Supplementary note by the Secretary, Imperial Council of Agricultural Research, dated the 7th July 1936, on Subject No. 29 :—Need for additional funds and staff for the Marketing Scheme in the Provinces :—

(i) Representation from the Government of Madras.

In reply to I. C. A. R. letter No. F. 51 (12)|36|G., dated the 20th April 1936 (Enclosure III to Appendix XXXIII), the attached letter No. 1491-II-36-2, dated the 15th June 1936 (Annexure) has been received from the Government of Madras and is circulated to the Advisory Board.

ANNEXURE.

COPY OF LETTER FROM SECRETARY TO THE GOVERNMENT OF MADRAS, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, NO. 1491-II|36-2, DATED THE 15TH JUNE 1936.

Your letter No. F. 51 (12)|36-G., dated 20th April 1936. In reply to your letter quoted above, I am directed to point out that the letter of the Vice-Chairman No. D.-696-A.-33, dated the 15th July 1933, had not made it clear that the Provincial Marketing Officer to be appointed at the cost of Provincial Governments should exclusively confine himself to the work of the Imperial Council of Agricultural Research, with the result that the Provincial Marketing Officer employed by the Madras Government was, as observed by you, being required now and then to investigate and report on the marketing of some commodities, such as jaggery, etc. This sort of investigation was only occasional but had to be referred to him as it demanded urgent attention and he had special knowledge and information at his disposal in virtue of the work he was doing in pursuance of the general scheme of market survey. It was the Agricultural Marketing Officer attached to the Council that first drew attention to the need of the Provincial Marketing Officer concentrating attention to the survey of the commodities programmed by the Council. Since then such extraneous items of work have been considerably curtailed and the Provincial Marketing Officer has been devoting practically his whole time to the work of the Council. The Assistant Marketing Officers paid by the Council have at no time been employed on this Government's investigations and the extra staff of 6 demonstrators and 6 messengers applied for by the Director of Agriculture are really needed for the survey programmed by the Council. The application for this extra staff was made by the Director of Agriculture early in November 1935, and, on receipt of your letter No. 5830-35-Gl., dated 13th December 1935, the Director of Agriculture was again asked to examine whether the application needed any revision and the application was recommended by the Government of Madras only after such an examination. The point has now again been examined and the Director is of opinion that the proposal requires no revision. The Government of Madras agree with the Director of Agriculture, Madras, and again request that the additional staff required by him may be sanctioned as otherwise the survey in view would be unnecessarily prolonged.

APPENDIX XXXIII-B.

Supplementary note by the Secretary, Imperial Council of Agricultural Research, dated the 13th July 1936, on Subject No. 29 (i) :—Representation from the Government of Madras, for additional funds and staff for the Marketing Scheme.

In continuation of the note, dated the 7th July 1936, already circulated to the Advisory Board (*Appendix XXXIII-A*), regarding the representation from the Government of Madras for an additional grant of Rs. 67,000 the alternative proposal submitted by the Provincial Marketing Officer, Madras, is circulated (Enclosure). The alternative proposal suggests the replacement of one upper division clerk by two typists with a view to accelerating the work within the present limit of one lakh spread over five years. In view of the possibility of additional funds not becoming available for the purpose, the Madras Government support the alternative proposal which is circulated. The alternative proposal will first be considered by the marketing sub-committee and the report of the Committee thereon will be placed before the Advisory Board in due course (*Appendix XXXI*).

ENCLOSURE.

COPY OF LETTER NO. 343-36, DATED 13TH JUNE 1936, FROM THE PROVINCIAL MARKETING OFFICER, MADRAS, TO THE DIRECTOR OF AGRICULTURE, MADRAS.

Reference.—Agricultural Marketing Adviser's endorsement No. A.-201 (1) of 5th May 1936 and paragraph 12(*b*) of the Proceedings of the Marketing Officers' Conference for 1936.

SUBJECT.—*Revised Budget Estimate—Marketing Section—Imperial Council of Agricultural Research.*

With reference to the letter quoted above, I am submitting proposals for increasing the clerical staff of the marketing section financed by the Imperial Council of Agricultural Research.

2. The present establishment consists of one Upper Division clerk on Rs. 55—5/2—70, two typists on Rs. 30—3/2—45—2/2—55 (one on old scale), one attender on Rs. 19—30 and 3 peons on 12—17 each.

3. It has been found in actual experience that the number of typists is quite inadequate for the typing work that has to be done, *viz.*, notes on marketing surveys, tabulation of figures, statements, progress reports, general correspondence, final reports, etc. The need for more hands, especially of typists, has been keenly felt. The delay in the submission of the final reports is largely due to lack of adequate number of typists. These hands will also be more suitable for tabulating figures of railway statistics, prices, etc., from different sources. It is therefore proposed to have two typists in place of one

Upper Division Clerk and this does not involve any appreciable extra expenditure as the pay of the typists will be only that of lower division clerks. The present Upper Division clerk has no typewriting qualifications. The special need for an Upper Division clerk has not also been felt so far in actual experience. I might add that in the original proposals made for clerical staff, provision was made only for four typists.

4. A revised Budget estimate has been submitted herewith on the lines indicated above. In place of an Upper Division clerk on Rs. 55—5/2—70, two typists on Rs. 30—Rs. 55 each have been proposed now. The amount budgetted for now is within the total provision made by the Imperial Council of Agricultural Research, *viz.*, one lakh of rupees. I request that the Imperial Council of Agricultural Research may be addressed early so that the revised proposals may be given effect to from 1st August 1936. The Agricultural Marketing Adviser to the Government of India, Delhi, desires that the revised budget may be sent before the next meeting of the Advisory Board of the Imperial Council of Agricultural Research which will be held on 13th July.

Marketing Staff—Financed by the Imperial Council of Agricultural Research.

Item No.	Details.	Actuals for 1934-35.	Actuals for 1935-36.	Estimate for 1936-37.	Estimate for 1937-38.	Estimate for 1938-39.	Estimate for 1939-40 till 31-12-39.	Total.	Remarks.
I	*Pay of Officers and Establishment*—	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
	1 Assistant Marketing Officer from 25th February 1935.	36	3,308	3,604	3,904	4,204	3,750	18,806	Rs. 275 from 25th February 1935. Rs. 300 from 25th February 1936. Rs. 325 from 25th February 1937. Rs. 350 from 25th February 1938. Rs. 375 from 25th February 1939.
	1 Assistant Marketing Officer from 21st February 1935.	72	3,008	3,308	3,608	3,908	3,500	17,404*	Rs. 250 from 21st February 1935. Rs. 275 from 21st February 1936. Rs. 300 from 21st February 1937. Rs. 325 from 21st February 1938. Rs. 350 from 21st February 1939.
	1 Assistant Marketing Officer from 23rd February 1935. (Joining time pay—22nd February 1935).	50 8	2,760	2,767	3,120	3,129	3,000	14,834	Rs. 230 from 23rd February 1935. Rs. 260 from 23rd February 1937. Rs. 300 from 23rd February 1939.
	Special pay for Provincial Marketing Officer from 21st February 1935.	15	600	600	600	600	500	2,915	Rs. 50 per month.
	One Upper Division Clerk Rs. 55—5/2—70.	..	444	150	..	..	..	594	Draws pay as lower division clerk only on Rs. 30, claim made till 31st July 1936. From 1st August 1936 two typists in place of the Senior clerk. Rs. 30 each from 1st August 1936, Rs. 33 each from 1st August 1938.
	Two typists Rs. 30—3/2—45—2/2—55.	..	..	420	720	834	624	2,598	

One typist (old scale Rs. 40—40—40—1½—55—1—65).	..	450	480	498	516	445	2,389	Rs. 40 from 1st March 1935. Rs. 41½ from 1st March 1937. Rs. 43 from 1st March 1938. Rs. 45½ from 1st March 1939.
One typist (new scale) Rs. 30—3/2—45—2/2—55	..	357	360	394	396	358	1,865	Rs. 30 from 4th March 1935. Rs. 33 from 4th March 1937. Rs. 36 from 4th March 1939.
One attender	..	219	228	251	252	229	1,179	Rs. 19 from 16th March 1935. Rs. 21 from 16th March 1937. Rs. 23 from 16th March 1939.
Three peons	6	429	432	432	462	390	2,151	Rs. 12 each from 21st February 1935, 27th February 1935, and 12th September 1935, respectively. Next increment for peons 21st February 1938, 27th February 1938 and 12th September 1938, respectively.
Total	187	11,575	12,349	13,527	14,301	12,796	64,735	
II *Allowances including Travelling Allowance—*								
(a) *House rent allowance—* For 3 Assistant Marketing Officers.	..	978	1,010	1,010	1,010	845	4,853	Claim has been estimated at a uniform rate of Rs. 27-8-0, Rs. 30 and Rs. 27 respectively for all the years.
1 Senior clerk (Rs. 6-8-0) till 31st July 1935, 1 typist (old grade) 1 typist (Rs. 6-0-0), and two typists (Rs. 6-8-0) each from 1st August 1935, 1 attender (Rs. 2-8-0) till 31st July 1935 and 3 peons (Rs. 2-8-0) each.	2	282	322	354	354	295	1,609	
Total ..	2	1,260	1,332	1,364	1,364	1,140	6,462	

*The increment is due to the increment since allowed.

Item No.	Details.	Actuals for 1934-35.	Actuals for 1935-36.	Estimates for 1936-37.	Estimates for 1937-38.	Estimates for 1938-39.	Estimate for 1939-40 till 31-12-39.	Total.	Remarks.
	(b) *Travelling allowance*—	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
	Travelling Allowances for 3 gazetted officers.	169	3,153	3,600	3,600	3,600	2,700	16,822	
	Travelling allowances for establishment.	..	683	1,068	1,000	1,000	632	4,383	
		169	3,836	4,668	4,600	4,600	3,332	21,205	
	Total allowances ..	171	5,096	6,000	5,934	5,964	4,472	27,667	
III	*Contingencies*	775	2,400	1,700	1,000	1,000	723	7,598	Provision of Rs. 700 for 2 typewriters.
	GRAND TOTAL ..	1,133	19,071	20,049	20,491	21,265	17,991	1,00,000	

Contingencies.

	Rs.
Maps	100
Stationery	250
Tour charges	150
Books and periodicals	150
Photo materials	200
Other contingencies	150
Total	1,000

APPENDIX XXXIII-C.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 4th June 1936, on Subject No. 29 :—Need for additional funds and staff for the Marketing Schemes in the Provinces :—

(ii) Representation from the Assam Government.

The Marketing Sub-Committee of the Advisory Board, which considered the representation mentioned above (Annexure) at its meeting held at New Delhi on the 12th February 1936, recommended that its consideration should be deferred till the next meeting of the Board in view of the fact that no more funds were then available. The Advisory Board adopted this recommendation, *vide* extract from the Proceedings of the Board reproduced below :—

*   *   *   *   *   *   *

" Mr. Livingstone explained that due to difficulties of communications in Assam, the Government had applied for an additional grant for more staff. It was proposed to defer the application for the next meeting of the Adivsory Board.

Mr. Vakil pointed out the importance of having a complete survey instead of an incomplete one inasmuch as the Government of India were spending about Rs. 20 lakhs. He suggested that the Conference of Marketing Officers shortly to be called for should go into the question of simplifying the method of the survey.

Sir Bryce Burt explained the genesis of the marketing scheme. The present scheme had been worked out in the knowledge that only a definite sum was available. He said that he saw no hope of getting further grants for this purpose until some results were forthcoming. The Government of India had already contributed Rs. 10 lakhs to the Provincial portion of the scheme and it was premature to ask for more. The marketing surveys should be completed within the present allotment by cutting down the list of commodities to be surveyed if necessary.

Mr. McDougall enquired if it would be permissible to employ more men on lower salaries within the allotted amount. Sir Bryce Burt replied that as this involved a question of efficiency he could not give a general answer.

Recommendation No. 5 was adopted ".

2. The representation (Annexure) is again for the consideration of the Advisory Board.

ANNEXURE.

COPY OF A LETTER NO. 4377-E, DATED THE 19TH NOVEMBER 1935, FROM THE SECRETARY TO THE GOVERNMENT OF ASSAM, IN THE TRANSFERRED DEPARTMENTS, SHILLONG, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

SUBJECT :—*Marketing Enquiry—Increase of Staff for.*

I am directed by the Government of Assam, to invite a reference to this Department letter No. 2270-E., of the 20th October 1934, and to forward an extract from a letter from the Director of Agriculture, Assam, which

bears out the apprehensions then entertained, that the provision made for a staff in Assam would be inadequate for the actual scope of the work expected by the Council. I am to enquire whether the Council would consider an additional grant of Rs. 1,316 for the period December 1935, to March 1936, which is the minimum considered necessary by the Director if the time schedule is to be maintained.

EXTRACT FROM LETTER NO. II. M.-1|3751, DATED THE 2ND NOVEMBER 1935, FROM THE DIRECTOR OF AGRICULTURE, ASSAM, TO THE SECRETARY TO THE GOVERNMENT OF ASSAM, IN THE TRANSFERRED DEPARTMENTS.

I have the honour to address you on the subject of the Marketing survey which is now being conducted in this province. The programme drawn up by the Agricultural Marketing Adviser, and adopted at the Marketing Officers' Conference held at Delhi in March last, requires the survey in regard to certain commodities, *viz.*, Eggs, Milk, Tobacco, Fruits, Groundnuts, Wheat and Linseed, to be finished by the end of December and that in regard to the remaining commodities, *viz.*, Hides, and Skins, Cattle, Rice, Fairs and Markets, Co-operative marketing, by the end of March 1936. From experience obtained during the last few months it appears quite certain that one Marketing Officer and two Assistant Marketing Officers are quite inadequate to bring the survey to a satisfactory conclusion within the short time allotted if the work is to be completed with the accuracy needed. The survey has to be more extensive than was formerly anticipated as it entails the breaking of much fresh ground and requires detailed supervision. The programme, is far too detailed for the small staff and for the conditions prevailing in this province where big markets and organised marketing are almost non-existent and all information has to be collected from the interior. For lack of communication facilities, touring in Assam is difficult particularly during the rains. There are also three hill districts in the province besides the two hilly frontier tracts and the Manipur State, where protracted touring during the rains is not possible. The work has been divided as follows between the staff :—

(1) Marketing Officer—General supervision and Cereals and Oil seeds in the Assam Valley.

(2) One Assistant Marketing Officer—All cattle products including hides and skins.

(3) One Assistant Marketing Officer—Fruits and vegetables for the whole province and Oil seeds and Cereals in Surma Valley.

I find that there is a very considerable amount of collection and compilation of Statistics and their interpretation which will have to be carried out at Headquarters by the Marketing Officer.

The result is that either the general supervision and the compilation of Statistics, or the enquiry on Cereals and Oil seeds in the Assam Valley, which are our most important crops, will suffer. Similarly one Assistant Marketing Officer cannot satisfactorily deal with fruits and vegetables, in which considerable improvement in marketing can be expected immediately over the whole province, as well as Cereals and

Oil seeds in Surma Valley. Moreover, it will be impossible for the present staff to visit the Hills at all within the time allotted, as touring in our Hills will probably take one officer nearly a month each. What is really wanted is an additional Assistant Marketing Officer for the Cereals of the whole province, thus relieving the Marketing Officer for supervision and Oil seeds and one Assistant Marketing Officer for fruits and vegetables alone.

In view of the above facts it is clear that either more time should be allowed or the staff should be strengthened immediately so that the work may be finished within a reasonable period. The result of any attempt on the part of the small staff to hustle the enquiry is bound to be unsatisfactory. No development work can be intelligently taken up on the basis of insufficient and inaccurate information which is all a hurried enquiry can provide. The compilation of figures and writing up all the Reports within this short period will also require the assistance of an additional clerk for this period.

I would therefore request you to move the Secretary, Imperial Council of Agricultural Research, to make provision for additional funds for the appointment of an additional Assistant Marketing Officer and a clerk for four months from 1st December 1935. I believe an additional Assistant Marketing Officer will be essential for Assam for the whole period of the enquiry if it is to be done satisfactorily on the lines laid down by the Marketing Adviser to the Government of India. A statement is enclosed herewith showing the amount which will be actually required for four months.

* * * * * * *

Supplementary grant for extra Staff in Assam, 1935-36.

	From 1st December 1935 to 28th February 1936 (3 months). 1935-36.	1936-37 March.	Total.
One Assistant Marketing Officer at Rs. 150	450	150	600
T. A. for A. M. O. and his peon at Rs. 125	375	125	500
One Typist at Rs. 40	120	40	160
One peon at Rs. 14	42	14	56
			1,316

APPENDIX XXXIII-D.

Supplementary note by the Secretary, Imperial Council of Agricultural Research, dated the 7th July 1936, on Subject No. 29 :—Need for additional funds and staff for Marketing Schemes in the Provinces : (ii) Representation from the Assam Government.

In continuation of the note, dated the 4th June 1936, on the subject mentioned above (Appendix XXXIII-C), already circulated to the Advisory Board, a copy of a letter from the Government of Assam, No. 1737-E., dated the 30th June 1936 (Enclosure), submitting a modified proposal for the entertainment of extra staff for the provincial marketing scheme, is circulated. The Local Government now propose to appoint one clerk and one peon involving an additional expenditure of Rs. 2,904 till the end of December 1939, in place of 1 additional Assistant Marketing Officer. The modified scheme will first be considered by the Marketing Sub-Committee and the Report of the Committee thereon will be placed before the Advisory Board in due course (Appendix XXXI).

ENCLOSURE.

COPY OF LETTER NO. 1737-E., DATED THE 30TH JUNE 1936, FROM H. G. DENNEHY, ESQ., I.C.S., SECRETARY TO THE GOVERNMENT OF ASSAM IN THE TRANSFERRED DEPARTMENTS, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

SUBJECT :—*Marketing Enquiry—Increase of staff for.*

I am directed by the Government of Assam to invite a reference to the correspondence resting with this Department letter No. 4377-E., dated the 19th November 1935, and to say that if the proposals cannot for any reason be fully met, the provision of funds for a clerk on initial pay of Rs. 55 per mensem and a peon on Rs. 14 is urgently requested by the Director of Agriculture, Assam. This would relieve the Assistant Marketing Officers of a good deal of office and statistical routine and leave them more time for field work. I am to ask that this alternative may also be placed before the next meeting of the Advisory Board of the Imperial Council of Agricultural Research, which will be held from the 13th to the 18th July 1936. The Government of Assam consider the additional staff necessary if the time schedule is to be maintained. The cost will be :—

	Rs.
1936-37	414
1937-38	846
1938-39	882
1939-40	762
Total ..	2,904

APPENDIX XXXIII-E.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 1st July 1936, on Subject No. 29 :—Need for additional funds and staff for the Marketing Schemes in the Provinces : (iii) Representation from the Government of Bombay.

The papers noted below are circulated to the Advisory Board for information. The formal application from the Government of Bombay for an additional grant of Rs. 12,000 for the employment of extra staff in connection with the marketing scheme in the Bombay Presidency, has not yet been received officially. Copies thereof will be circulated to the Advisory Board for consideration in due course. The representation will be considered in the first instance by the Marketing Sub-Committee at its meeting to be held at Simla no the 14th July 1936, at 3 P.M. :—

Letter No. A.-202, dated the 19th June 1936, from the Agricultural Marketing Adviser to the Government of India together with enclosures (Annexure).

ANNEXURE.

COPY OF LETTER FROM A. M. LIVINGSTONE, ESQ., AGRICULTURAL MARKETING ADVISER, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, SIMLA, No. A.-202, DATED THE 19TH JUNE 1936.

With reference to Subject No. 29, dealing with the need for additional funds and staff for the marketing scheme in the Provinces, I beg to enclose herewith copy of a letter which I have to-day received from the Director of Agriculture, Bombay, forwarding a statement showing the additional expenditure required amounting to Rs. 12,000 in round figures.

2. I have written to the Director of Agriculture asking that this application be forwarded through the local Government in the usual way, but I am forwarding this copy in order to give you time for printing before the meeting.

COPY OF LETTER FROM THE DIRECTOR OF AGRICULTURE, BOMBAY PRESIDENCY, POONA, TO THE AGRICULTURAL MARKETING ADVISER TO THE GOVERNMENT OF INDIA, SIMLA, No. 32-8458, DATED THE 16TH JUNE 1936.

With reference to your endorsement No. A.-201 (1) of 6th instant to the address of the Live-stock Expert to Government, Bombay, and the Marketing Officer for the Bombay Presidency, I have the honour to say that that officer now informs me that it is not possible to find any saving in the grant of Rs. 20,000 sanctioned for the Marketing Survey work for the current financial year under the following primary units by re-adjustment of expenditure :—

Rs. 7,136 for pay of officers.
Rs. 3,240 for pay of establishment.
Rs. 6,000 for travelling allowance.
Rs. 3,624 for contingencies.

Rs. 20,000.

He, however, points out to me the necessity of employing 4 men of the type of *dalal's* assistants to help in going carefully through the books of merchants for the necessary information, as they cannot afford to place any of their staff at the disposal of the Assistant Marketing Officers but are ready to have their accounts examined. He also needs the services of a draftsman for preparing graphs and diagrams. The extra cost involved on account of this additional establishment comes to Rs. 12,000 in round figures as per detailed statement attached. I would now request that you will be so good as to arrange to provide this additional grant from the funds at the disposal of the Imperial Council of Agricultural Research and communicate the sanction to me so that I may arrange with the Bombay Government to provide the necessary amount in the budget estimates of the marketing survey scheme.

Statement showing the additional expenditure required for the Provincial Marketing Scheme.

Posts and Pay.	1936-37 (9 months).	1937-38.	1938-39.	1939-40.	1940-41 (1 month).	Total.
4 *dalal's* assistants in the scale of 40—2—50 ..	1,440	1,992	2,088	2,184	184	7,888
1 Draftsman in the scale of 75—5—100	675	945	1,005	1,065	90	3,780
Total ..	2,115	2,937	3,093	3,249	274	11,668

12,000 in round figures.

APPENDIX XXXIII-F.

Supplementary note by the Secretary, Imperial Council of Agricultural Research, dated the 11th July 1936, on Subject No. 29 (iii) :—

Representation from the Government of Bombay.

In continuation of note, dated 1st July 1936, on the subject mentioned above (Appendix XXXIII-E), already circulated to the Advisory Board, a copy of letter No. A.-202, dated the 11th July 1936, from the Agricultural Marketing Adviser to the Government of India (Annexure) is circulated to the Marketing Sub-Committee and the Advisory Board.

ANNEXURE.

COPY OF LETTER No. A.-202, DATED THE 11TH JULY 1936, FROM THE AGRICULTURAL MARKETING ADVISER TO THE GOVERNMENT OF INDIA, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, SIMLA.

SUBJECT :—*Marketing Scheme—Additional staff and funds required for Bombay Presidency.*

I have the honour to forward herewith a copy of a letter (with Enclosure) No. 991-A.-33, dated the 8th July 1936, received by me from the Bombay Government, asking for an additional grant of Rs. 12,000 from the Imperial Council of Agricultural Research, for the proposed employment of 4 *dalal* Assistants and 1 Draughtsman in connection with the Marketing Scheme. It may be observed that the estimates which have been submitted with reference to the Proceedings of the Marketing Officers' Conference, 1936 [page 14, paragraph 12 (*b*)], provide for these appointments for 9 months during 1936-37 (*i.e.*, from 1st June 1936) and until 31st March 1940—the date on which five years reckoned from the date of appointment of the existing Bombay Marketing Staff will expire. The estimates might, however, have been prepared from, say, 1st August 1936, up to the 31st December 1939, when the five year period of the main Marketing Scheme will terminate. This will reduce the estimates to Rs. 10,300 approximately, as detailed below :—

During	Rs.
1936-37 (from 1st August 1936)	1,645
1937-38	2,911
1938-39	3,067
1939-40 (up to 31st December 1939)	2,675
Total ..	10,298
	or say
	10,300

2. As no such communication appears to have been received so far by you from the Bombay Government, it is suggested that these papers may be circulated to the Advisory Board for consideration.

ENCLOSURE.

COPY OF LETTER NO. 991-A.|33, DATED THE 8TH JULY 1936, FROM THE OFFG. SECRETARY TO THE GOVERNMENT OF BOMBAY, REVENUE DEPARTMENT, BOMBAY CASTLE, TO THE AGRICULTURAL MARKETING ADVISER TO THE GOVERNMENT OF INDIA.

SUBJECT :—*Marketing, Scheme for improvement of............in India.*

I am directed by the Government of Bombay (Transferred Departments) to forward for your information a copy of the letter from the Director of Agriculture, No. 32-8458, dated 16th June 1936, together with a statement showing the additional expenditure required in connection with the entertainment of additional staff required for the marketing scheme in this Presidency. I am to add that the Government of Bombay approve the Director's proposals and recommend that the Imperial Council of Agricultural Research may be moved to sanction the additional grant of Rs. 12,000 as soon as possible.

COPY OF LETTER NO. 32|8458 OF 1936, DATED THE 16TH JUNE 1936, FROM THE DIRECTOR OF AGRICULTURE, BOMBAY PRESIDENCY, POONA, TO THE AGRICULTURAL MARKETING ADVISER TO THE GOVERNMENT OF INDIA, SIMLA.

SUBJECT :—*Agricultural Marketing in India, Marketing Officers' Conference, 1936.*

With reference to your endorsement No. A.-201 (1), dated 6th instant to the address of the Live-stock Expert to Government, Bombay, and the Marketing Officer for the Bombay Presidency, I have the honour to say that that officer now informs me that it is not possible to find any saving in the grant of Rs. 20,000 sanctioned for the Marketing Survey work for the current financial year under the following primary units by re-adjustment of expenditure :—

Rs.	
7,136	for pay of officers.
3,240	for pay of establishment.
6,000	for travelling allowance.
3,624	for contingencies.
20,000	Total.

He, however, points out to me the necessity of employing four men of the type of *dalal's* assistants to help in going carefully through the books of merchants and dealers who are approached for the necessary information, as they cannot afford to place any of their staff at the disposal of the Assistant Marketing Officer but are ready to have their accounts examined. He also needs the services of a draftsman for preparing graphs and diagrams. The extra cost involved on account of this additional establishment comes to Rs. 12,000 in round figure as per detailed statement

attached. I would now request that you will be so good as to arrange to provide this additional grant from the funds at the disposal of the Imperial Council of Agricultural Research and communicate the sanction to me so that I may arrange with the Bombay Government to provide the necessary amount in the Budget estimates of the Marketing Survey Scheme.

Statement showing the additional expenditure required for the Provincial Marketing Scheme.

Posts and pay.	1936-37. (9 months).	1937-38.	1938-39.	1939-40.	1940-41. (1 month).	Total.
4 *dalal's* Assistants in the scale of 40—2—50.	1,440	1,992	2,088	2,184	184	7,888
1 Draughtsman in the scale of 75—5—100	675	945	1,005	1,065	90	3,780
Total ..	2,115	2,937	3,093	3,249	274	11,668

Rs. 12,000 in round figures.

APPENDIX XXXIII-G.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 13th July 1936, on Subject No. 29 :—Need for Additional Funds and Staff for the Marketing Schemes in the Provinces :— (IV) Representation from the Government of the Punjab.

The attached representation on the subject mentioned above (Annexure), is circulated to the Advisory Board. The representation will first be considered by the Marketing Sub-Committee and the report of the Sub-Committee thereon will be circulated to the Board for consideration in due course (Appendix XXXI).

2. The recommendation of the Local Government is awaited. It is, however, understood that they will support the proposal.

ANNEXURE.

COPY OF LETTER No. 230-C., DATED THE 10TH JULY 1936, FROM THE OFFG. DIRECTOR OF AGRICULTURE, PUNJAB, TO THE JOINT SECRETARY TO GOVERNMENT, PUNJAB, DEVELOPMENT DEPARTMENT.

SUBJECT :—*Scheme for the improvement of Agricultural Marketing in India.*

With reference to Punjab Government endorsement No. 568-D., dated the 21st February 1935, communicating the acceptance by the Punjab Government (Ministry of Agriculture) of the grant sanctioned by the Imperial Council of Agricultural Research for the appointment of Provincial Marketing Staff in connection with the scheme for the improvement of agricultural marketing in India, I have the honour to say that the shortage of clerical staff provided for in the scheme was discussed in a joint conference of the Central Marketing Staff and Senior Marketing Officers held at Delhi from the 27th April to the 2nd May 1936 [*vide* para. 12 (*b*) of the attached proceedings, return requested] (not printed). The Agricultural Marketing Adviser suggested that Senior Marketing Officers should scrutinise their budgets with a view to see whether it would be possible to provide more clerical staff from the savings in their budgets and if so a revised budget for the five years period (commencing 1st January 1935) should be submitted to the Imperial Council of Agricultural Research through the local Governments concerned.

2. The Marketing Officer, Punjab, has accordingly scrutinised his budget with the result that he anticipates a saving of Rs. 4,284 (*vide* statement attached). He has asked for the appointment of two additional clerks and one peon for his office. The present clerical staff sanctioned for the Marketing Officer consists of one Head Clerk, one Accountant—each in the grade of Rs. 75—5—100|5—125 and two junior clerks on Rs. 40—2—80|2—90 (less 15 per cent) each. At present two of these clerks are constantly engaged in compiling and typing data for the Assistant Marketing Officers and consequently other office work which is heavy greatly suffers. I am convinced of the necessity for this additional staff and shall be glad if the attached statement is forwarded to the Imperial Council of Agricultural Research with a request that two

additional clerks each on Rs. 40—2—80|2—90 (less 15 per cent) be sanctioned. The additional cost involved can be met from the savings in the total grant.

3. I am sorry that this reference was not made earlier. The Advisory Board of the Imperial Council of Agricultural Research meets from the 13th to the 18th instant and I shall be obliged if necessary action is taken at a very early date. A copy is being forwarded to the Secretary, Imperial Council of Agricultural Research, for advance information.

***Statement** showing the anticipated expenditure of the Marketing Scheme from 15th March 1935, to 14th March 1940.*

	1934-35.	1935-36 (actuals).	1936-37.	1937-38.	1938-39.	1939-40.	Upto 14/3/40.	Total	
	Rs.	Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs.	
Pay of Officers (Three Assistant Marketing Officers).	..	5,595 11	7,726 13	8,366 10	8,906 7	9,446 7	359 0	40,401	Pay of Ch. Zafar Alam, Assistant Marketing Officer (Oilseeds) Rs. 220 p.m. upto 10th August 1936 and 230 p.m. from 11th August 1936 increment at Rs. 15 from 11th August 1936 every year. Pay of Assistant Marketing Officers (Live-stock) and (Fruits) at Rs. 190 and 170 p.m. respectively upto 30th April 1936 and at 215 p.m. each from 1st May 1936 and at Rs. 230 p.m. each from 15th March 1937. Increment at Rs. 15 every year. *Dates of Increment.* Head Clerk —1st April each year. Accountant—14th June each year. One Junior Clerk—15th March each year. One Junior Clerk—27th April each year.
Pay of Establishment (four clerks and 3 peons).	..	3,264 0	3,742 0	3,910 0	4,078 0	4,191 0	159 0	19,344	
Compensatory allowance ..	..	90 0	108 0	108 0	108 0	108 0	5 0	527	
Travelling Allowance ..	20	4,764 0	5,500 0	5,500 0	5,500 0	5,500 0	..	26,784	
Contingencies*	585	1,855 0	1,570 0	1,550 0	1,550 0	1,550 0	..	8,660	
Total ..	605	15,568 11	18,646 13	19,434 10	20,142 7	20,795 7	523 0	95,716	
Anticipated Savings ..	..	..	..	..	..	..	..	4,284	
	Additional staff proposed to be employed out of the savings.								
2 Clerks on Rs. 40—2—80/2—90. (less 15%) from 1st September 1936.	..	..	408 0	840 0	888 0	936 0	40 0	3,112	
1 peon at Rs. 14 p.m. from 1st *September 1936.*	..	..	84 0	168 0	168 0	168 0	7 0	595	
Compensatory allowance to clerks and peon from 1st September 1936.	..	..	42 0	84 0	84 0	84 0	4 0	298	
Total ..	..	..	534 0	1,092 0	1,140 0	1,188 0	51 0	4,005	
Add for unforeseen expenditure ..			..	..	—	..	..	279	
Grand Total ..	..	..	..	..	..	..	..	1,00,000	

*Includes cost of stationery and publications.

(Sd.) KARTAR SINGH,
Marketing Officer, Punjab, Lahore.

APPENDIX XXXIII-H.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 13th July 1936, on Subject No. 29 :—Need for Additional Funds and Staff for the Marketing Schemes in the Provinces : (V) Representation from the Government of Bihar and Orissa.

The attached two letters from the Government of Bihar and Orissa (Annexures I and II) for the continuance of the Junior Marketing Officer for a further period of 2 months with effect from 28th June 1936, and for the appointment of one temporary compiler for a period of 2 years are circulated to the Advisory Board.

The proposals will first be considered by the Marketing Sub-Committee and the report of the Committee thereon will be circulated to the Advisory Board in due course (Appendix XXXI).

ANNEXURE I.

COPY OF LETTER No. 705-D.R., DATED THE 30TH JUNE 1936, FROM THE SECRETARY TO GOVERNMENT, EDUCATION AND DEVELOPMENT DEPARTMENT, BIHAR.

SUBJECT :—*Marketing Survey in the States.*

With reference to your letter No. F. 51|3|35|G., dated the 6th March 1936, I am directed by the Government of Bihar (Ministry of Education) to enclose a copy of letter No. 5865, dated the 8th June 1936, from the Director of Agriculture, Bihar, and to request that in the circumstances stated by the Director of Agriculture, your council may kindly be moved to sanction the extension of the term of the appointment of the additional temporary Junior Marketing Officer for a further period of two months, with effect from the 29th June 1936 at a total cost of Rs. 730.

COPY OF LETTER No. 5865, DATED THE 8TH JUNE 1936, FROM THE DIRECTOR OF AGRICULTURE, BIHAR, TO THE SECRETARY TO THE GOVERNMENT OF BIHAR, EDUCATION AND DEVELOPMENT DEPARTMENT.

SUBJECT :—*Marketing Survey in the States adjoining Orissa.*

I have the honour to refer to Government order No. 1631-D., dated the 31st March 1936, in which sanction of Government was accorded to an expenditure of Rs. 1,095 for undertaking a marketing survey in the States adjoining Orissa.

2. Babu Madan Mohan Pradhan, temporary Junior Marketing Officer, joined on the 29th March last and up to the end of May he could visit only eight States for marketing survey. At least ten or eleven more of the important States have to be visited and thereafter he has to write his report which will take him at least a month. It is, therefore, impossible to finish the work within the sanctioned period of three months which will

expire on the 28th June 1936. I, therefore, request that the term of sanction may be extended by another two months at a total cost of Rs. 730 as detailed below. Babu Madan Mohan Pradhan will continue to hold the post of temporary Junior Marketing Officer :—

	Rs.
(1) Pay of temporary Junior Marketing Officer for 2 months @ Rs. 200 a month	400
(2) Travelling allowance of the Junior Marketing Officer for 2 months @ Rs. 150 a month	300
(3) Pay of temporary peon for 2 months @ Rs. 9 a month	18
(4) Travelling allowance of temporary peon for 2 months @ Rs. 6 a month	12
	730

3. The first year's grant as sanctioned for the Marketing scheme was Rs. 19,730. Against this a sum of Rs. 16,236-15-0 was spent during 1934-35 and 1935-36. The saving thus amounted to Rs. 3,493-1-0. Against this saving an expenditure of Rs. 1,095 has been authorised in the Government Order referred to above. Further expenditure of Rs. 730 proposed in para. 2 will be met from the balance of savings left.

ANNEXURE II.

COPY OF LETTER No. 713-D.R., DATED THE 2ND JULY 1936, FROM THE SECRETARY TO GOVERNMENT, EDUCATION AND DEVELOPMENT DEPARTMENT, BIHAR.

SUBJECT :—*Appointment of one compiler for the Bihar and Orissa Marketing Scheme.*

I am directed by the Government of Bihar (Ministry of Education) to enclose a copy of letter No. 6213, dated the 15th June 1936, from the Director of Agriculture, Bihar and to request that in the circumstances stated therein your Council may kindly be moved to sanction the appointment of one temporary compiler on Rs. 40 a month for two years for the Bihar and Orissa Marketing Scheme at a total cost of Rs. 1,440.

COPY OF LETTER No. 6213, DATED THE 15TH JUNE 1936, FROM THE DIRECTOR OF AGRICULTURE, BIHAR, TO THE SECRETARY TO THE GOVERNMENT OF BIHAR, EDUCATION AND DEVELOPMENT DEPARTMENT.

SUBJECT :—*Appointment of one compiler for the Bihar and Orissa marketing Scheme.*

I have the honour to refer to Government order No. 862-D., dated the 2nd March 1935, sanctioning the clerical staff for the Bihar and Orissa marketing scheme and to say that the Senior Marketing Officer, Bihar and

Orissa, reports that it was agreed at the last conference of the Marketing Officers held at Delhi in May last that it would be almost impossible to finish the work within the scheduled time without extra clerical assistance. Accordingly, it was resolved that the clerical staff of the provincial marketing offices should be strengthened by the addition of at least two compilers, the cost on account of these is to be met from savings from existing grant. The Senior Marketing Officer, Bihar and Orissa has, therefore, come up with the proposal for the appointment of one temporary compiler for a period of two years as he is unable to find funds for the employment of two from savings within the sanctioned grant. The compiler will have to do touring in order to compile railway statistics from various railway stations. Although I am inclined to think that two extra hands are the minimum necessary for collection and compilation of the statistics I am unable to recommend the appointment of two as funds are not available. I, therefore, request that sanction of the Imperial Council of Agricultural Research may be obtained for the appointment of one temporary compiler on Rs. 40 a month for two years at a total cost of Rs. 1,440 as detailed below :—

	Rs.
Pay @ Rs. 40 per month for two years	960
Travelling allowance @ Rs. 20 per month for two years	480
	1,440

There was a saving of Rs. 3,493-1-0 in the first year's estimate owing to delay in the appointment of staff out of which Rs. 1,825 will be spent on the employment of the additional Junior Marketing Officer sanctioned for the Orissa States. This leaves a balance of Rs. 1,668-1-0 and it is proposed that cost of entertainment of the compiler should be met out of this amount. No additional grant is, therefore, required from the Imperial Council of Agricultural Research.

APPENDIX XXXIV.

Note by the Secretary, Imperial Council of Agricultural Research, date the 11th July 1936, on Subject No. 35 :—Notes on the Lines of Futu Marketing Developments.

The attached note prepared by the Agricultural Marketing Adviser t the Government of India on lines of future marketing developments is ci culated to the Advisory Board (Annexure). It will first be discussed i the Marketing Sub-Committee and the report of the committee thereon wil be circulated to the Advisory Board for consideration in due course.

ANNEXURE.

Notes on Lines of Future Marketing Developments.

The marketing surveys so far conducted show that all-India standards and grades are not only possible but desirable for several commodities and also that in certain cases a considerable body of the trade are in favour of the early adoption of uniform standards. It seems clear from the surveys that much of the adulteration of produce which takes place is due to the low basis of quality permitted in trading contracts and the variation in basis from one part to another. The adoption of uniform standards would, therefore, to a large extent remove the incentive to adulteration.

The surveys also show that it is very difficult and sometimes almost impossible to compare the prices of a product in different markets. On that account producers and merchants are practically limited to dealing only on those markets with which they have direct personal relations. It is highly desirable to stimulate a more widespread and rapid movement of produce to those centres where it commands the highest price. Prices based on a uniform standard of quality would be reliable and comparable and the adoption of such standards would greatly facilitate inter-trading between different markets. A beginning should therefore be made as soon as possible to put into effect on an experimental and voluntary basis the principles of standardisation.

Grading and Marking.—For trading on the internal market the definition at an early date of standards and grades for grain and oilseeds, hides and skins, fruits, eggs and probably also tobacco and certain dairy products seem not only practicable but desirable. The detailed standard specification in each case cannot be worked out until the relative marketing survey is fully complete and till producers, traders and processors concerned have been consulted on the finer points of technical detail. In the meantime, however, statutory provision should be made for the issue of regulations establishing grades and standards as occasion arises.

For certain commodities standard methods of packing and the type, size, and weight of containers and contents will have to be specified and in most cases also some recognised method of marking will have to be employed to distinguish different grades. Any regulations which may be issued should therefore cover such points as well.

Registration of Producers, etc.—Where physical grading has to be done (*e.g.*, fruit) and the produce packed and marked and in cases where it has to be submitted to a certain amount of processing (*e.g.*, the boiling of ghee) or manufacture (*e.g.*, making of butter), the persons (producers, packers, processors or manufacturers) who are prepared voluntarily to adopt and observe the prescribed standard grades should be registered and in the event of their failure to observe the grades properly they should be removed from the register.

Market Charges.—Another point arising out of the marketing surveys is the very heavy charges—charities, octroi, samples, weighment, etc., levied on agricultural produce passing through some markets, and also the big variation* in the amount of and nature of such charges even between markets situated relatively close to one another. Similar conditions apply in the case of slaughter-houses.

Distant producers and merchants particularly who send their produce to such markets and slaughter-houses are liable to be badly hit by the unexpected amount of the charges. This again hampers the free movement of produce since it is not enough for the sender to know the price prevailing in a market but also the amount of the market charges before he can calculate which is the most profitable market for his goods.

Damage to Produce.—Another outstanding point in connection with markets is the amount of waste and spoilage of produce which occurs in them owing to the bad state of the market place due to the absence of sanitary arrangements and suitable shelter for man, beast and produce. It would be an enormous task to try and regulate forthwith the charges in all markets and slaughter-houses throughout India and to remodel their structure and layout at the same time. There are, however, already in existence a number of markets and slaughter-houses under municipal, community or private control which are fairly well run and where the charges are comparatively reasonable.

Registration of Markets and Slaughter-houses.—It is suggested that for the benefit of senders—particularly those in the more distant producing centres—a register should be prepared of all clean and sanitary markets and slaughter-houses under adequate control where the market charges are fixed approximately at a reasonable standard, in which the system of weighment is dependable and some fair arrangements exist for

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*The reports so far received show the following variations in charges (including terminal tax, etc.) in different types of produce in markets and in slaughter houses.

Type of Market.	*High.*			*Low.*			
	Rs.	a.	p.	Rs.	a.	p.	
Cereals and Oilseeds	7	13	3	0	3	9	Per cent.
Fruit	13	12	0	2	12	0	Per cent.
Cattle (weekly markets)	1	0	0	0	1	0	Per head.
Cattle (Fairs)	2	10	0	0	0	6	Per head.
Slaughter houses (sheep)	0	3	3	0	1	3	Per head.
cattle	15	12	0	0	4	6	Per head.

the settlement of disputes. In registered markets the system of sale also should be satisfactory. (For example, if bidding under the purdah is practised the final buyers' bid should be openly declared). Further, some arrangements should, if required, be made in such markets for collecting and posting up the daily prices, arrivals and stocks of certain classes of produce dealt with in the markets. It is suggested that the A. M. A. should be empowered to prepare such a register and to publish or take such other steps as may be reasonably possible to bring to the notice of producers :—

(*a*) the name and location of registered markets,

(*b*) the amount of the market charges prevailing in those markets,

(*c*) the prices ruling in those markets from time to time, and

(*d*) the daily, weekly, or monthly arrivals and stocks.

Merchants' Commissions, etc.—Merchants operating in the same market charge different rates of commission* and one merchant may charge different rates from day to day and different senders with different rates. Particularly if the sender is new or not well known or if he sends only occasional supplies, a merchant is inclined to charge relatively heavy rates. Fear of such invidious distinctions tends to drive produce into stereotyped channels depending on known personal relationships. This limits the free play of market forces and tends to restrict the area of distribution of produce.

Registration of Merchants.—It is suggested that a maximum limit might be adopted for "merchanting" charges (excluding market charges and interest in respect of credit allowed) and a register might be prepared of all reputable† merchants whose total charges are under this limit. This list should be made available to producers and others concerned. In the first instance, registration might be restricted to merchants operating in registered markets.

Summary of Proposed Legislation.—It is suggested that legislation of an enabling character should be promoted as soon as possible. The question whether any of this should be Central or whether it could all be Provincial has yet to be examined. Legislation may be required for the following purposes :—

1. Statutory standards and grades of agricultural produce to be defined and corresponding grade designations and marks to be prescribed—the adoption and use of such standard grades,

*The following rates of merchants' commissions are given in the reports so far received in respect of different classes of produce in certain markets :—

Type of Market	*High.* Rs.	a.	p.	*Low* Rs.	a.	p.	
Cereals and Oilseeds	3	14	0	0	8	0	Per cent.
Fruit	9	8	0	3	2	0	Per cent.
Cattle	10	0	0	0	2	0	Per head.

†It would probably be sufficient as a measure of repute to take the recommendation of a trade association or require that a merchant should have traded under the same name for 5 years without default in his legitimate debts.

designations and marks to be voluntary—and for prescribing standard units of weight, size, measure or count and type of containers to be used in connection with such graded produce.

2. The registration of producers, packers, processors or manufacturers who are prepared to adopt and use the statutory grades in connection with the sale of produce.

3. The registration of markets (including Fairs and slaughter-houses) wherein suitable provision is made for the clean and proper handling and marketing of agricultural produce and where the controlling authority limits the market charges—including terminal tax, etc.—to a stated amount which is reasonable, having regard to the type of market and the class of produce dealt with.

4. The registration of merchants handling different classes of produce who are prepared to operate on a constant and fixed "merchanting" charge—excluding market and interest charges—within a reasonable maximum limit.

5. The issue of regulations to give effect to the foregoing proposals and for establishing, where necessary, appropriate committees of producers and traders to advise on matters affecting their interests.

6. For the establishment of trade associations with statutory recognition and powers to control trading in certain commodities, *e.g.*, the East India Cotton Association.

OLD SECRETARIAT BUILDINGS,

DELHI,

7th July 1936.

APPENDIX XXXV.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 5th June 1936, on Subject No. 15 :—New Indian Dairy Diploma Course for Provincial Agricultural and Veterinary Colleges.

Attention is invited to the enclosed copy (Annexure) of a letter No. F. 24|1-36-A., dated the 14th May 1936, from the Government of India in the Education, Health and Lands Department. Members are no doubt aware that a certain amount of instruction in Dairy farming is being given at most of the Agricultural colleges in India at present, as part of the degree course and the Board could probably agree on a common syllabus for part I of the I. D. D. course which would suit agricultural colleges and those veterinary colleges like Patna which teach dairying. Having done this the syllabus for Part II of the course to be given at Bangalore would be relatively simple. The subject will be considered by a special committee on the 15th July 1936, and its report (Appendix XXXVI) will be submitted to the Advisory Board in the usual course.

ANNEXURE.

Copy of a letter from the Additional Deputy Secretary to the Government of India in the Department of Education, Health and Lands, to the Secretary, Imperial Council of Agricultural Research, No. F. 24|1-36-A., dated the 14th May 1936.

Committee, Appointment of Dairy Diploma, Indian, Training of Candidates for ——.

I am directed to request that the Government of India may be favoured with the views of the Advisory Board of the Imperial Council of Agricultural Research, and if considered desirable of a technical committee of the Board, on the question of improving the existing arrangements for imparting Dairy training to students in this country. The Board might be asked—

(*i*) to report in particular on the existing system of training and the facilities available at the Dairy Institute, Bangalore, and at the Allahabad Agricultural Institute ;

(*ii*) to design a suitable course of training, corresponding as nearly as possible to the N. D. D. course in England, for candidates for the Indian Dairy Diploma in this country and to recommend what minimum educational standard should be required for Indian Dairy Diploma students in future. The course should, if possible, be split into two parts ; Part I—Elementary, to be taught at the Agricultural Institute, Allahabad, or any other provincial Institution or college, which may be recognised for this purpose, and Part II—Higher Instruction, which would be imparted at the Dairy Institute ;

(*iii*) to lay down a syllabus and suggest centres for holding the examination of students for that Diploma, and

(*iv*) to make suggestions for the constitution of a Board of Examiners and the conduct of examination every year.

2. I am to forward, for the information of the Board, a copy (Enclosure) of a letter No. F.-384|35-A., dated the 6th April 1936, addressed to the Director, Imperial Institute of Agricultural Research, of which a copy has been endorsed to Local Governments, regarding the developments now taking place at the Dairy Institute, Bangalore, from which it will be observed that the Government of India consider that the time has come to give effect to the recommendations contained in paragraph 211 of the report of the Royal Commission on Agriculture by limiting instructional work at Bangalore to teaching in higher dairy technology and that within a period of 5 years the more elementary and general instruction in dairy farming should be provided provincially. It is therefore important to consider what portion of the revised Indian Dairy Diploma course could conveniently be taught in agricultural and|or veterinary colleges and in what provinces the necessary equipment exists or could be provided in the very near future.

ENCLOSURE.

COPY OF A LETTER FROM THE JOINT SECRETARY TO THE GOVERNMENT OF INDIA IN THE DEPARTMENT OF EDUCATION, HEALTH AND LANDS, TO THE DIRECTOR, IMPERIAL INSTITUTE OF AGRICULTURAL RESEARCH, DELHI, No. F.-384|35-A., DATED THE 6TH APRIL 1936.

Dairying Section—Separation from Imperial Department of Agriculture.

In continuation of this Department letter No. F.-384|35-A., dated the 6th January 1936, I am directed to say that the Government of India have decided that the Imperial Institute of Animal Husbandry and Dairying at Bangalore and the farm at Wellington should be separated from the Imperial Department of Agriculture with effect from the 1st April 1936, and along with the experimental creamery which it has been decided to establish at Anand, should be constituted into a separate office to be designated for the present as the Dairy Institute. The Institute will be under the control of the Imperial Dairy Expert, who will have his headquarters at Bangalore and will be directly subordinate to the Government of India in the Department of Education, Health and Lands.

2. The functions of the Institute may be broadly classified under the two heads, *viz*.—

(*a*) Advisory and educational, and

(*b*) Research and experiment.

(*A*) *Advisory and educational*.—This head includes advice to the Agricultural, Industries and Veterinary Departments in the provinces and Indian States and to the general public who are engaged in the dairy industry. Applications for advice on the more advanced technical processes will ordinarily be received through the Local Governments in the first instanee. The educational work includes the training of—

(*i*) post graduate students, and

(*ii*) students taking the I. D. D. course.

It will be restricted to imparting higher instruction in dairying, *i.e.*, post-graduate instruction in such matters as Dairy Technology and Research. For the present, however, the Institute will continue to impart elementary instruction, as none of the provinees is in a position to undertake it satisfactorily, but Local Governments are being warned that after say five years

the work of training students in dairy farming will entirely devolve on them. As technological training in commercial dairying is essential for the Indian Dairy Diploma and this can only be given properly at the central Dairy Institute, students for the Indian Dairy Diploma will receive one year's instruction at this Institute after completing a satisfactory course in a provincial institution. They will also, if desired by the Imperial Dairy Expert, be given opportunities of spending, in the course of their training, some time at Karnal in order to study mixed farming methods in Northern India.

As regards the testing of dairy products for the public the more intricate tests will have to be performed by the Institute but simpler testing will be left to the provinces.

(B) Research and experiment.—The problems of animal nutrition are being dealt with by a separate section which is to be located at Izatnagar. The research work which will be carried out at the Dairy Institute includes—

(1) the problems connected with the quality, handling and transport of milk and milk products, the chemical constituents and the physico-chemical characteristics of the milk of different breeds of cows and buffaloes. The buffaloes at Karnal may, if so desired by the Imperial Dairy Expert, be transferred to Bangalore ;

(2) the range of diurnal and seasonal variation ;

(3) dairy bacteriology ;

(4) problems connected with butter and cheese making and the investigation of the modifications required in India in the processes as carried out in western countries and the standardisation of the indigenous methods ;

(5) problems of ghee and the improvement and standardisation of existing methods of production ;

(6) testing of new types of milk handling and dairy machinery and equipment ; and

(7) the investigation of the most economic methods of utilising milk produced in rural areas on a factory scale. This means condensing, tinning, milk powder manufacture, casein making (as well as butter, cheese and ghee) and the evolution of methods of manufacture which are suitable for Indian conditions.

A small but properly equipped chemical and bacteriological laboratory would be required for carrying out the first three items of work mentioned above but the Government of India trust that it will not be necessary to build a separate chemical laboratory at Bangalore and that when the Physiological Chemist is transferred to Izatnagar it will be possible to utilise the buildings vacated by him for this purpose. Opportunity should also be taken to shift the office of the Imperial Dairy Expert from its existing site to a building in the Institute.

3. The cattle-breeding farm at Karnal has already been transferred to the Imperial Agriculturist but it is not intended that he should conduct experiments in cattle-breeding, which subject must, very largely, be dealt with by Provincial Governments. The pedigree registration of herds

maintained under the Central Government should be done through the Imperial Council of Agricultural Research, Animal Husbandry Bureau, and under whichever officer those herds are placed for administrative purposes, the breeding policy should be laid down by the Standing Cattle Breeding Committee of the Imperial Council of Agricultural Research, on which the Central Institutes connected with cattle breeding will be represented. Technical details in the carrying out of this breeding policy should be settled by the Director of the Institute concerned in consultation with the Animal Husbandry Expert to the Council. The Animal Husbandry Bureau of the Imperial Council of Agricultural Research is also undertaking the registration of pedigree cattle of milch breeds in the various provinces and States and it is desirable that the above principles should, so far as possible, be observed in regard to the principal breeding herds of the major breeds of all-India importance. Provincial Governments and the Indian States concerned are being asked if they will agree to such co-ordination of cattle breeding policy.

4. In order to facilitate future work on animal genetics it is essential to maintain the pure-bred herds at Pusa, Karnal and Bangalore and I am accordingly to request that—

(*i*) the pedigree herds of Hariana and Tharparkar Cattle should be maintained at approximately their existing strength by the Imperial Agriculturist at Karnal and that the records of their milk production and fat content should be kept, as in the past, since they will furnish valuable data when genetical work is taken up. The Hariana herd should be definitely earmarked for genetical studies and be transferred to Izatnagar whenever required for experimental breeding work,

(*ii*) the old established Pusa (Montgomery) Sahiwal herd should be maintained by the Imperial Agriculturist at New Delhi, and

(*iii*) the Sindhi herd should be maintained by the Imperial Expert at Bangalore.

5. It is important that the organisations under the Director, Imperial Institute of Agricultural Research, the Director, Imperial Institute of Veterinary Research (including the Animal Nutrition Institute) and the Imperial Dairy Expert should work with full knowledge of one another's activities and in co-operation with one another. I am accordingly to suggest that these officers should, at least once a year and if possible more often, meet and discuss the programmes of their respective organisations.

6. With reference to your letter No. 687-D., dated the 6th February 1936, I am to say that necessary action to separate the funds required for the Imperial Dairy Institute, which are included in the budget of the Imperial Institute of Agricultural Research, will be taken later and to request that the amount of pay and allowances disbursed from the Karnal budget for 1936-37 to the Accountant and the Supervisor who have been transferred to Bangalore may be communicated to the Government of India to enable them to transfer the balance of the provision on account of their pay and allowances to the budget of the Imperial Dairy Expert.

7. A copy of this letter is being sent to the Director, Imperial Institute of Veterinary Research and the Imperial Dairy Expert, Bangalore, for information and necessary action.

APPENDIX XXXVI.

Proceedings of the Special Sub-Committee for I. D. D. Courses appointed by the Imperial Council of Agricultural Research held at the Legislative Assembly Building, Simla, at 10-30 A.M. on Wednesday, the 15th July 1936.

The following were present :—

1. Sir Bryce Burt (*Chairman*).
2. Mr. E. J. Bruen.
3. Rai Sahib D. V. Bal.
4. Sardar Datar Singh.
5. Khan Bahadur Maulvi Fateh-ud-Din.
6. Sardar Kartar Singh.
7. Mr. D. N. Khurody.
8. Mr. Zal R. Kothavalla.
9. Mr. R. W. Littlewood.
10. Colonel A. Olver.
11. Mr. C. H. Parr.
12. Major P. B. Riley.
13. Mr. P. T. Saunders.
14. Mr. S. M. A. Shah.
15. Dr. Burch H. Schneider.
16. Rai Bahadur B. Viswanath.
17. Mr. F. Ware.
18. Mr. A. C. Aggarwala (*Secretary*).

Visitors :

1. Rai Sahib S. Ghosh.
2. Mr. P. J. Kerr.
3. The Pattagar of Palayakotai.

The Chairman in opening the meeting mentioned that the Royal Commission on Agriculture recommended that instructions in Dairying should be a provincial matter but provinces had expressed their inability to make this provision. It had now been decided by the Government of India that after a reasonable interval the training given at the Bangalore Institute should be limited to advanced training and dairy technology and that elementary training in Dairying should be imparted at Provincial Agricultural and Veterinary institutions where it could probably be carried out without seriously disturbing their present arrangements. There was also a need for raising the standard of instruction above the present I. D. D. standard. After discussion the Committee came to the conclusion that the Nagpur, Allahabad, Poona, Coimbatore and Lyallpur Agricultural Colleges and the Patna Veterinary College were probably in a position to undertake the instruction for the first part of the new

I. D. D. Course and that the Madras Veterinary College would be in that position if the proposed dairy were sanctioned. It was stated that since the introduction of the I. D. D. course about 230 students had passed out, of which about 120 were from the Bangalore Institute and the rest from the Allahabad Agricultural Institute and that 90 per cent. of the Bangalore students had secured employment.

In surveying the position generally the Committee agreed that :

(1) the present I. D. D. Course was not high enough and that advanced instruction in dairying was essential if dairying in India was to be properly developed ;

(2) for advanced technological training in dairying the most suitable place was the Bangalore Institute ;

(3) there are 6 or 7 colleges in India (as mentioned above) which with possible minor alterations could take up instruction in Part I of the new course ;

(4) there must be one common examining body for the Part I examination before students were admitted to the Part II course at Bangalore ;

(5) in the event of more than one institute being recognised eventually for instruction in Part II the Examining Board for both would be the same.

It was agreed that the adequacy of equipment and staff in Provincial colleges was a matter for Provincial Governments to consider before applying for recognition of a provincial college for the Part I of the Course.

The main heads of instruction as laid down in the Syllabus were then discussed and the following decision was arrived at as to the subjects that should be included in Part I and Part II respectively :—

(1) *General management of a Dairy Farm.*—Mainly provincial except that instruction in commercial dairy farm management of an advanced character should be given at the Central Institute.

(2) *Management of Dairy and Creamery.*—Elementary instruction in dairy appliances that are not power-driven should be given in provincial institutions, but greater part of this training will fall in Part II and be dealt with at Bangalore.

(3) *Management of Live-stock in Health and Disease.*—This is mainly a matter for provincial colleges but advanced instruction will be necessary at Bangalore with special reference to the commercial side of dairying. (To carry out this instruction satisfactorily it would be necessary to add a Veterinary Graduate to the staff of the Central Dairy Institute.)

(4) *Dairy Chemistry.*—A thorough general training in Chemistry (both inorganic and organic) is already given in provincial colleges and there should be no difficulty in providing for instruction in the Elementary Testing of Milk, Cream,

Butter and Ghee. Dairy Chemistry proper would be taught at the Bangalore Institute where the chemical staff would have to be strengthened.

With regard to (c) feeding, the principles of feeding would be taught at provincial institutions but the chemistry of feeding and food-stuffs would be dealt with at the Bangalore Institute.

(5) *Dairy Bacteriology.*—Elementary instruction in Milk Hygiene would be given provincially ; all instructions in Dairy Bacteriology at the Central Institute.

(6) *Machinery and equipment of Dairy and Farm.*—At provincial colleges the management and upkeep of hand-driven dairy appliances and of small dairy boilers would be dealt with. A complete course of instruction in Dairy Engineering would be given at the Central Institute.

(7) *Dairy Book-keeping and Records.*—Maintenance of herd records and elementary farm accounts would be taught at provincial colleges ; the general principles of Book-keeping would be taught at the Central Institute which would also give advanced instruction in the keeping of pedigree records, history sheets, etc.

(8) *Principles of Co-operative Dairying.*—This subject would be taught in Part II, *i.e.*, at the Central Institute. The Committee agreed that poultry breeding, vegetable cultivation and pig rearing were valuable adjuncts to Dairy Farming but arrangements for instruction in these subjects, if any, might be left to Provincial Governments. These subjects should not form a part of the examination at the end of Part I instruction. In regard to Item (6) on page 5 of the Imperial Dairy Expert's note, special courses from (a) to (g) should be specifically included in the course at the Central Institute. The Institute should also arrange to give short courses in these subjects to persons engaged in the Industry and qualified to take them.

It was further agreed that in preparing the detailed Syllabus for the Central Institute the 2 years' work should be so arranged as to facilitate the giving of higher instruction in provincial institutions, especially with regard to the management of dairy farms, keeping in mind that the Central Institute is specially intended for advanced training in Dairy Technology. It may be possible to recognise one or more provincial institutions for the first year of Part II. The Committee then decided that two Boards of examiners for Part I and Part II examination would be required as under :—

Board of Examiners for the entrance examination for the Bangalore Dairy Course on completion of Part I.

1. The Principal of the Central Institute, *ex-officio*, Chairman.

2. An Expert in Live-stock in Health and Disease—to be selected from a veterinary college.

3. An Agricultural Chemist, to be taken from one of the Agricultural Colleges ; and
4. A dairy husbandman.

Board of Examiners for Part II examination.

1. A Dairy Technologist (from outside India at the outset).
2. A Dairy Husbandman.
3. Dairy Chemist.
4. Commercial Dairyman.

With reference to page 3, last 3 lines of his note, Mr. Kothavalla explained that these remarks did not apply to Agricultural Colleges.

A Sub-Committee, consisting of the Animal Husbandry Expert as the Chairman, Mr. Zal R. Kothavalla, Dr. Burch H. Schneider, Mr. A. C. Aggarwala, Sardar Kartar Singh and Sardar Datar Singh, was then appointed to prepare a detailed syllabus for the two parts of the course above discussed. Due regard to be paid to the existing syllabuses of Agricultural and Veterinary Colleges.

The meeting adjourned at 1 P.M.

APPENDIX XXXVII.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 27th June 1936, on Subject No. 14 (i) :—Application from the Government of Bombay (for Sind) for a Grant of Rs. 4,45,670 spread over five years for Sub-Surface Investigation work carried out in the Lloyd Barrage Area in Sind.

Attention is invited to the attached copy of an application from the Government of Bombay (Annexure I) for a grant of Rs. 4,45,670 spread over five years including—

(*i*) part of the capital expenditure of Rs. 4,08,116 already incurred by the local Government, *viz.*, Rs. 2 lakhs, and

(*ii*) a recurring grant of Rs. 2,45,670 for the five years from 1935-36 to 1939-40 (Rs. 49,134 per annum),

in connection with sub-surface investigation in the Lloyd Barrage area in Sind. The Bombay Provincial Agricultural Research Committee did not recommend the scheme on the grounds, that it was a continuation of the work begun by the local Government for which they should be responsible and was not a scheme of pure agricultural research. The Government of Bombay, however, did not accept the conclusion arrived at by the Committee and forwarded the scheme to the Council in October 1935. Since then, Sind has been constituted into a separate province and the scheme will now have to be considered as one emanating from the Government of Sind. The scheme outlined is apparently of vital importance to the proper development of the Lloyd Barrage. As far as the Council is concerned, it includes certain portions of work which are of considerable importance to agriculture in general, such as (*i*) the complete physical and chemical analyses of the samples obtained in the soil survey of the area and (*ii*) work on water-logging. The former particularly is covered by the specific recommendation of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India on the report of the Soil Amelioration Committee (*vide* extract attached to Enclosure III, Annexure I). Further particulars obtained by the Secretariat of the Council from the Government of Bombay regarding details of the expenditure proposed, will be found in Annexure II.

2. The Government of Sind were requested to revise the proposals to include only the items of work which are of all India importance, *viz.*, the chemical and physical analyses of soils obtained as a result of the soil surveys already carried out and general work on water-logging. In their letter, No. 59-I., dated the 17th June 1936 (Annexure III) the Local Government have prepared separate statements showing the recurring and non-recurring expenditure to be incurred on the work of chemical and physical analyses of the soil samples collected in the Barrage area and an estimate of the future non-recurring expenditure (as distinct from the non-recurring expenditure already incurred by the local Government) for the general work on water-logging. The revised scheme would cost, as far as the Council is concerned, Rs. 1,07,840 (Rs. 26,000

non-recurring for the period 1st April 1936 to 30th September 1937 and Rs. 81,840 recurring). The proposals are not quite clear but a representative of the Sind Irrigation Department will attend the meetings of the Committee and the Advisory Board to explain details.

3. It may be pointed out in this connection that the proposed 'Capital' expenditure relates apparently to expenses in connection with observations and not to expenses in connection with the buildings, equipment, etc., as is generally understood by this term in schemes sanctioned by the Council.

4. The subject will in the first instance be discussed by the Soil Science Committee and its report Appendix XXXVIII will be submitted to the Board in due course.

ANNEXURE I.

COPY OF LETTER FROM THE SECRETARY TO THE GOVERNMENT OF BOMBAY, PUBLIC WORKS DEPARTMENT, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, NO. 4399/27-1, DATED THE 14TH OCTOBER 1935

I am directed by the Governor in Council to forward copies of the following documents in connection with the proposal of this Government that the Imperial Council of Agricultural Research be approached for the grant of a subsidy towards the cost of the sub-surface investigation work being carried out in the Lloyd Barrage area by the staff of the Research Division of the Irrigation Department in Sind :—

(*i*) A note dated 5th April 1934 (Enclosure I) prepared by Mr. C. G. Hawes, Executive Engineer, Development and Research Division in Sind in accordance with the recommendations of the Sind Research Committee, on the proposal that the Imperial Council of Agricultural Research be approached for a grant towards the cost of the sub-surface investigation work being carried out in the Lloyd Barrage area.

(*ii*) The proceedings of the meeting of the Bombay Provincial Agricultural Research Committee held in November 1934 (Enclosure II), so far as they relate to the note prepared by Mr. Hawes, Executive Engineer, Development and Research Division in Sind, on the subject of the sub-surface investigation work being carried out in the Lloyd Barrage area.

(*iii*) A report submitted by the Chief Engineer in Sind with his letter No. 156-W/1, dated 15th June 1935 (Enclosure III), justifying the proposal that the Imperial Council of Agricultural Research be requested for a grant towards the cost of the sub-surface investigation work being carried out in the Lloyd Barrage area.

2. The Bombay Provincial Agricultural Research Committee does not favour this proposal. The Government of Bombay, however, do not accept the conclusion arrived at by this Committee and they support in toto the views and arguments advanced by the Chief Engineer in Sind in his report submitted with his letter No. 156-W/1, dated 15th June 1935. The Soil Amelioration Committee has given evidence of its appreciation of the work being done in Sind and they consider it to be of great value (*vide* extract from the proceedings of the Committee attached to the report of the Chief Engineer in Sind). A complete description of the work being undertaken is given in Mr. Hawes' note dated 5th April 1934 and it is considered that the importance of this research, from the point of view of the general interests of agriculture in Sind, is such as to justify a grant being made towards the cost involved from the funds earmarked for this purpose available for distribution by the Imperial Council of Agricultural Research. This Government would advance the view that results of the greatest value and scientific interest to the whole of India and possibly to the world in general will be obtained during the course of the next ten years in view of the scale on which the research is being carried out. The Imperial Council of Agricultural Research has extended its patronage to Sind on very rare occasions in the past although this province is now one of the Major Irrigation Provinces in India and it is considered that the research work being done in Sind may be held to justifiably claim assistance on the grounds of its scope and general scientific interest.

3. A precis of the work done up to date and that remaining to be done is detailed in Appendix III (Enclosure III) and a statement of the expenditure incurred and still to be incurred in this connection is given in Appendices IV and V (Enclosure III) attached to the report of the Chief Engineer in Sind (Enclosure III). It will be seen from Appendix IV that the total capital expenditure incurred on the work upto 30th September 1935 is Rs. 4,08,115. This figure is inclusive of all recurring expenditure upto that date. The annual recurring expenditure anticipated on the work in the financial years 1935-36 to 1939-40 is shown in appendix V (Enclosure III).

4. In the circumstances explained above I am to request you to commend the scheme to the favourable consideration of the Imperial Council of Agricultural Research and to move that body to sanction the following grants towards meeting the cost of this work :—

	Rs.
(*i*) A lump sum grant of Rs. 2 lakhs to cover a part of the capital expenditure of Rs. 4,08,116 incurred (*vide* Appendix IV—Enclosure III)	2,00,000
(*ii*) A grant of Rs. 49,134 to meet the annual recurring expenditure involved for a period of 5 years covering the financial years 1935-36 to 1939-40 (*vide* Appendix V—Enclosure III)	2,45,670
Total ..	4,45,670

Enclosure I.

NOTE DATED 5TH APRIL 1934, BY MR. C. G. HAWES, EXECUTIVE ENGINEER, DEVELOPMENT AND RESEARCH DIVISION IN SIND, ON PROPOSAL TO ASK FOR A GRANT FROM THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, TOWARDS THE COST OF THE SUB-SURFACE INVESTIGATION WORK CARRIED OUT IN THE LLOYD BARRAGE AREA.

1. *History and reasons for the formation of the Development and Research Divison in Sind.*

Early in the period of construction of the Lloyd Barrage and Canals project, the question of possible waterlogging was brought very prominently to notice by the experience of the Punjab Irrigation Department. In the Punjab water-logging has, on some of the older canal systems, become a very serious problem indeed and it has been necessary for the Punjab Government to set up a special organization for the investigation of water-logging problems and to undertake expensive drainage schemes with a view to the reclamation of water-logged and damaged lands and to the prevention of extensions of the trouble. The canal systems in the Bombay-Deccan, which are fed from storage reservoirs, have also experienced a certain amount of trouble due to the damaging, or waterlogging, of lands as a consequence of irrigation from the canals. The experience of the Punjab and the Bombay-Deccan indicated that similar trouble might be expected in Sind and led to the investigation of conditions in the areas commanded by the Lloyd Barrage canals with a view to ascertaining the possibilities of water-logging following the commencement of Barrage irrigation. It was found, as a result of preliminary investigations, that a very large area on the Right Bank (approximately 3,500 square miles) in which the predominant crop was rice, had a high sub-soil water table. The water table in this area was found to vary, yearly, from 3 feet to 12 or 13 feet below the surface of the ground ; the water table being nearest the surface at the end of the irrigation season in October and lowest at the commencement of the irrigation season in June. In the other areas commanded by the Barrage, notably those on the Left Bank of the river, the sub-soil water table was found to be situated at much lower levels and the problem of possible water-logging was, therefore, considered to be most urgent on the Right Bank.

The pre-Barrage system of irrigation on the Right Bank was from inundation canals taking off the river Indus, and the cultivation on these canals consisted, principally, of rice. These canals ceased to flow at the end of September, or early in October, in each year and no water was put on to the land commanded by them for the period from October in one year to June in the next year. The sub-soil had, therefore, time to recover and get rid of the additions of water made during the irrigation season, before the next irrigation season commenced. In this area rainfall is usally scanty, but occasionally heavy falls occur and the effect of these falls on the sub-soil water levels does not appear to be very great. Investigations into the variations in sub-soil water levels in the Right Bank area as measured in wells, for a period of ten years, showed that rainfall appeared to have very little effect on the depth of sub-soil water table below the surface at the end of the irrigation season, and

it is considered that this is probably due to the fact that, since the whole of the area under rice cultivation is saturated and flooded with irrigation water when the rain falls in July and August, the additional water brought by the rain merely drains naturally to the drainage lines of the country, or is compensated for to some extent by a reduction in the discharge of canals.

Under post-Barrage conditions, the area of rice cultivation on the Central Rice Canal will be surrounded on the North, North-West, South and East by perennial cultivation, and since the periodical lowering of the sub-soil water level in the rice area was presumably due, in part at least, to the movement of water through the sub-soil from areas in which the level is high to areas in which it is low, it appeared possible that the new perennial irrigation which surrounds the rice area might affect, adversely, the drainage capacity of the soil and therefore cause a gradual, but persistent, upward trend in the level of sub-soil water resulting eventually in water-logging. The danger of water-logging in this area of rice cultivation within a fairly short period of years after the commencement of Barrage irrigation was thus apparent and, in order that as much knowledge as possible should be available for the study of the question, it was decided to carry out investigations into sub-surface conditions in the Right Bank Area.

A special organization called the Development and Research Division, was created for this purpose and the investigation of sub-surface conditions in the Right Bank area was carried out in the working season 1930-31, during the course of which it was decided to extend the investigation to the whole of the Barrage command.

This investigation work has been planned so as to give as much information as possible about sub-surface conditions in the Barrage area and data have been obtained in regard to the various strata underlying the surface, the levels of the sub-soil water table and the salinity of the sub-soil water itself, and, by the analysis of samples of soil taken from the various strata and from samples of sub-soil water, much information has been, or will be, obtained regarding the physical composition of the various strata, the quantities of soluble salts present and the alkalinity of the soil or the sub-soil water, etc.

The Development and Research Division has undertaken the detailed investigation and mapping of the various large areas in which the main investigation work showed the predominance of *kalar* lands and has established an organization for measuring, at intervals of two months, and for the whole Barrage command, the level of the sub-soil water table in a system of permanent observation pipes and in a large number of village wells.

2. *The work which the Development and Research Division has done, is doing and is to do.—*

(*a*) *The work completed up to date.*

(*i*) *The main investigation.*—The development and Research Division has completed the main investigation into sub-surface conditions in the whole of the Barrage irrigation command (an area of 11,500 square miles) and a detailed description of the method adopted, the boring apparatus used, and

the organization of personnel, is to be found on pages 4 to 9 of Bombay Engineering Congress Paper No. 136, a copy* of which is attached. The main investigation work, including the collection and working up of data, has now been completed and much information of very great value to the Irrigation and Agricultural Departments, and also it is considered, to any zemindar who is interested in the purchase, or the reclamation, of land is available. The movements in the sub-soil water levels in the whole area are being recorded and data for statistical investigations are being collected in regard to rainfall, fluctuations in sub-soil water levels, applications of irrigation water from the various distributing units in the Barrage system, etc. In addition, plans are being collected of every distribution command in the whole of the Barrage system, which contain information in regard to established rice cultivation, etc.

Some 40 new rain gauges have been established at suitable points on the new Barrage canals in order to give a closer picture of rainfall conditions than is available from the existing gauges, which are very irregularly spaced.

The Khairpur State provided funds during the working season 1932-33 for the completion of main investigation in the majority of the area in the State which is under Barrage irrigation, and this work to the extent of 700 square miles, has been completed by the Development and Research Division on behalf of the State. The reading of the permanent observation pipes left in this area is, however, being carried out by the State's own organization.

(*ii*) *Detailed Investigation work into kalar Lands.*—Data have been collected and plans prepared for 5,09,952 acres of land in which *kalar* has been found, from the main investigation work, to be predominant, and in the laboratory at Kotri, analysis of a large number of samples from actual *kalar* patches are in hand. The object of the detailed investigation work is to obtain plans of the main *kalar* areas which will facilitate the watching of these areas in future and will enable changes in the distribution of *kalar* land to be followed very easily. By correlating data which has been collected regarding surface appearance, the growth of flora on the surface and the analyses of samples taken from *kalar* areas, it is hoped that it will be possible to work out a satisfactory system of classification of *kalar* lands by visual indications assisted by the minimum amount of scientific tests. Such a system of classification, if it can be worked out satisfactorily, will be of very great value in future operations. Detailed investigations into *kalar* areas (2,00,000 acres in all on the right Bank) are in progress during the working season 1933-34 and by the end of the working season, data will have been collected for an area of 7,09,952 acres.

(*iii*) The main investigation of some 1,000 square miles and detailed investigation into some 1,50,000 acres (situated in 4 patches) of the Begari Canal Command have been, or will very shortly be, completed and the main investigation is to be extended to cover the remaining area of the Shikarpur Canals division on the Right Bank of the river amountir ; to 300 square miles, in which waterlogging symptoms have become apparent.

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* Not enclosed.

(*iv*) Detailed investigations have been carried out in an area of 100 square miles lying in a belt on both sides of the Rohri Canal in its first 22 miles of length. In this area serious waterlogging has already occurred in patches immediately adjacent to the Canal and signs of rising water table have become apparent at distance upto 1½ miles from the canal itself.

(*b*) *Work remaining to be done.*

The work remaining to be done by the Development and Research Division is as follows :—

(*i*) The completion of the detailed investigation into *kalar* areas in the Barrage Command ; this involves the classification and mapping of some 2,00,000 acres still remaining on the Right Bank command and 5,76,000 acres in the Left Bank command and will be carried out by one sub-division during the next two working seasons (1933-34, 1934-35).

(*ii*) The completion of the main and detailed investigation in the Begari Canal area involving main investigation of 400 square miles and detailed investigation of 82,000 acres.

(*iii*) The carrying out of main investigation in the Shikarpur Canals area in which water-logging has threatened in certain places involving work in an area of 300 square miles.

(*iv*) The carrying out of detailed investigation into an area of 17 square miles lying between the Rohri Aror hills and the New Eastern Nara Canal, in which serious water-logging has already appeared.

(*v*) Carrying on continuously with the observations of sub-soil water levels in the permanent observation pipes and wells, the analysis of soil and water samples in the laboratory, and the collecting and recording of irrigation data, rainfall, etc.

When sufficient data is available, the division will have to undertake the necessary statistical investigation of the data.

The experimental and statistical sub-division is now employed very largely on the collection and recording of data and will later on make the statistical investigation of data so collected.

Cost of the work done and to be done.

3. The cost of the work done, and yet remaining to be done, by the Development and Research Division, falls naturally into two sections :—

(*i*) Capital expenditure.

(*ii*) Recurring expenditure.

Table I shows the probable expenditure (incurred and to be incurred) on the collection of data and the completion of the main and detailed investigations into *kalar* areas in the Barrage command, and includes all expenditure on observation, analysis, etc., upto the end of the financial year 1933-34, and Table II shows the annual recurring expenditure required to finance the collection of data in regard to sub-soil water levels, etc., for a 5 year period covering the financial years 1934-35 to 1938-39 inclusive.

In calculating the probable cost of completing detailed investigation work and the probable recurring expenditure, estimates have been based on the rates at which work of similar nature has been carried out up-to-date. In preparing the tables of expenditure, no provision has been made for the cost of divisional supervision of the work, and nothing has been allowed for the cost of the Sub-divisional Officers, where these have been regular Assistant Engineers on the Bombay establishment. The cost of Divisional establishment has been omitted because the Bombay Government must, in any case, for the safety of the Barrage irrigation, establish Drainage Division to deal with the problem of the rise in sub-soil water table and maintain the Development and Research Division for the collection of data and the inclusion of the cost of Divisional establishment in the capital expenditure, towards which assistance is to be asked, is not justifiable. The exclusion of any cost on account of pay of the Sub-Divisional Officers and their Travelling Allowance (where members of the B. E. S.) is justified because such officers must be paid by the Government of Bombay whether employed on Drainage or sub-soil investigation work or not.

Appendices A and B show details of establishment, pay, etc., required for the 2 sub-divisions which will be involved, and Table III shows an abstract of the total cost in capital and recurring expenditure for a period of 5 years from the year 1934-35.

4. It will be necessary to collect data for a period of 10 years before statistical investigation work can be taken up with a reasonable hope of obtaining satisfactory results but it is suggested that, in the first place, an application should be made for a grant covering the recurring expenditure for a period of 5 years. At the end of such a period it will be possible to review the position, and decide whether to ask for a grant to cover the recurring expenditure for a further period. There is little doubt that, if irrigation is to be efficiently controlled and the dangers of water-logging intelligently anticipated, the reading of sub-soil water levels, the collection of data and the statistical investigations of that data must be continued indefinitely.

5. The investigations described in this note and the recording of data in regard to sub-soil water levels, irrigation, rainfall, etc., are all matters of extreme importance to Agriculture in Sind. In fact even in the short period during which the Barrage canals have been supplying irrigation water on the Right Bank of the Indus, the data which has been collected from these investigations has brought to light a very serious rise in the sub-soil water table in very large parts of the area irrigated by the Rice Canal and the North Western Perennial Canal system. While it is yet, perhaps, too early to state that the rise in the sub-soil water table will continue and will therefore become a very serious menace to irrigation, there is, however, ample justification for the continuance of the observation of sub-soil water levels and the collection of irrigation and rainfall data. The situation is, in fact, so serious that the Government of Bombay have sanctioned the formation of a Drainage Division to investigate conditions in those areas on the Right Bank command in which

water-logging appears likely to occur in the near future, to investigate the general question of the drainage of the Right Bank command (together with the Begari and Shikarpur Canals Divisions on the Right Bank) and to study particularly the best method of dealing, urgently, with such smaller areas as may require immediate treatment particularly in their relation to the major and general scheme of drainage for the whole of the Right Bank. It is clear from the above that the fears expressed in 1928 regarding a possible rise in sub-soil water table appear unfortunately to be materializing and the carrying out of the sub-surface investigations has been fully justified by the results which have been obtained up-to-date.

In April 1934, a second Drainage Division, is being formed to deal with drainage problems in the Left Bank Command.

Although the work described above cannot perhaps be classified strictly as Agricultural Research Work, such as has been carried out at Sakrand, it is considered that it is of sufficient importance to the agriculture of Sind, to justify a grant from the Imperial Council of Agricultural Research. In addition, the work is being carried out on such a scale that it will certainly produce results in the course of the next 10 years which will be of the greatest value to other provinces in India, and indeed will be of very considerable scientific interest to the world in general. This, it is considered, is a further and most cogent justification for a grant towards the cost of the work.

It is suggested that the grant from the Imperial Council of Agricultural Research, should be made in two parts :—

(*a*) a grant towards the total capital expenditure required for the main and detailed investigation in the Barrage area, and

(*b*) a grant towards the recurring expenditure to be made on reading and recording sub-soil water levels and on the collection and working up of statistics for a period of 5 years, *i.e.*, up to the end of the financial year 1938-39.

A reference to Table III will show that the total capital expenditure will be about Rs. 3,47.913 and, it is suggested that a lump sum grant of Rs. 1,50,000 should be given on this account. Table III also shows that the total recurring expenditure to be incurred during a period of 5 years from the 1st of April 1934 in the collection of data is Rs. 2,45,670 and a grant of Rs. 49,134 per year should be given from the financial year 1934-35 for a period of 5 years in the first instance, making a total contribution of Rs. 2,45,670 in the 5 years.

The Sind Research Committee are impressed with the value of the work which has been done and with the imperative necessity for its continuation, and would therefore press for the rapid disposal of this case.

APPENDIX A.

Yearly cost of separate organization for observing wells and pipes from 1934-35 onwards.

	Pipes.	Wells.
On Right Bank	458	137
On Left Bank	992	228
	1,446	365
Total ..	1,811	

Basis of calculation of staff required:

One Darogha can observe 150 Nos. every two months :—

No. of Daroghas required $= \frac{1,811}{150} = 12$ say.

Estimate for 1934-35 excluding the cost of pay and T. A. for the Sub-Divisional Officer.

	Rs.
4 Overseers @ Rs. 91 each	4,368
12 Darogas at Rs. 50 each	7,200
1 Assistant Draftsman @ Rs. 72	864
2 Tracers @ Rs. 54 each	1,296
1 Clerk @ Rs. 54	648
7 Khalasis @ Rs. 19 each	1,596
	15,972
T. A. and Establishment Contingencies	3,000
Replacing missing pipes and clearing choked pipes, etc.	3,900
Total ..	22,872

APPENDIX B.

COST OF EXPERIMENTAL AND STATISTICAL SUB-DIVISION.

Estimate for 1934-35.

(Excluding pay and T. A. of the Sub-Divisional Officer.)

	Rs.
1 Statistician at Rs. 300	3,600
2 Computors (Statistical Assistants @ Rs. 100)	2,400
1 Overseer @ Rs. 120 less 10% = Rs. 108	1,296
1 Assistant Draftsman @ Rs. 80 less 10% = Rs. 72	864
2 Tracers @ Rs. 60 less 10% = Rs. 54	1,296
1 Clerk @ Rs. 50 less 10% Rs. 45	540
2 Khalasis @ Rs. 20 less 5% Rs. 19	456
	10,452
Karachi Local Allowance ..	1,500
	11,952
Yearly expenditure when 2/3 expenditure is debited to soil investigation work.	8,368

TABLE I

Statement showing the actual expenditure incurred up to 30th September 1933 and probable expenditure to be incurred upto 31st March 1934, by the Development and Research Division on various main and detailed investigation and well-observation works.

Nature of work.	Actual expenditure incurred upto 30th September 1933.					Probable expenditure after September 1933 to 31-3-34 and 1935.	Grand Total.	Remarks.
	1930-31.	1931-32.	1932-33.	1933-34 upto 30-9-1933.	Total actual expenditure upto September 1933.			
Main Investigation	44,884	79,710	13,920	..	1,38,514	..	1,38,514	
Detailed investigation	..	898	24,747	1,981	27,626	67,000	94,626	
Water and Soil Analysis ..	..	2,208	7,031	3,260	12,499	4,000	16,499	
Well-observation	..	..	6,418	8,570	14,988	10,500	25,488	
2/3 Cost of sub-Divisional Establishment and Travelling allowance.	7,520	22,234	20,900	11,066	61,720	11,066	72,786	
Total ..	52,404	1,05,050	73,016	24,877	2,55,347	92,566	3,47,913	

TABLE II.

Recurring expenditure on well-observation work, etc., from 1st April 1934 to 31st March 1935.

Nature of work.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.	Total.
Well-observation work	19,000	19,000	19,000	19,000	19,000	95,000
Water and Soil Tests	8,000	8,000	8,000	8,000	8,000	40,000
2/3 Cost of Sub-Divisional Establishment and Travelling allowance.	22,134	22,134	22,134	22,134	22,134	1,10,670
Total ..	49,134	49,134	49,134	49,134	49,134	2,45,670

TABLE III.

Abstract of expenditure incurred and to be incurred by the Development and Research Division on various investigation works.

Nature of work.	Amount.	Remarks.
A.—Capital Expenditure.		
	Rs.	
Main investigation, Statement I	1,38,514	
Detailed investigation, Statement I	94,626	
Water and soil tests, Statement I	16,499	
Well-observation work, Statement I	25,488	
2/3 cost of Establishment and Travelling Allowance, Statement I.	72,786	
Total ..	3,47,913	
B.—Recurring Expenditure.		
Water and Soil Tests, recurring Statement II	40,000	
Well-observation, recurring Statement II	95,000	
2/3 cost of Establishment and T. A., recurring Statement II.	{ 22,134 88,536	
Total ..	2,45,670	
Grand Total ..	5,93,583	

Enclosure II.

PROCEEDINGS OF THE MEETING OF THE BOMBAY PROVINCIAL AGRICULTURAL RESEARCH COMMITTEE HELD IN NOVEMBER 1934.

2 (1) *Sub-surface investigation work in the Lloyd Barrage area.*—Mr. Evershed explained the scheme and gave account of what had been done to observe the growth of water-logging in Sind. He also gave account of what had been done both with regard to observation on waterlogging and the reclamation of water-logged lands in the Deccan. Referring to the work mentioned in Mr. Hawes' note, he said what was now required was the completion of this work, and the last three sheets of Mr. Hawes' note gave his ideas as to what should be done. Mr. Evershed also read a Demi-official letter from Mr. Inglis supporting the

scheme. In reply to the Honourable Minister, Mr. Evershed said that he believed the Sind scheme would be useful to all alluvial areas, *i.e.*, Sind, part of the Punjab, U. P., and part of Bengal. In reply to Dr. Burns, Mr. Evershed said that the Irrigation Department in the Punjab were investigating their problems. Sardar Bhimbhai Naik made a reference to a Scheme passed by the Advisory Board of the Imperial Council of Agricultural Research which he believed dealt with water-logging in the Punjab, but Dr. Burns pointed out that this was a special research dealing with the microflora of alkaline and water-logged soils. Principal Gokhale asked how the research was going to help agriculturists and stated that this scheme was simply a collection of data and not research. Dr. Wheeler also emphasised the point that this was a scheme meant to spend a good deal of money on the accumulation of data and stated that the necessity for the work arose directly as a result of the Bombay Government's own action and hence the Bombay Government were really responsible for doing the work. Rao Bahadur Sahasrabuddhe pointed out that the observation reported had been in progress for some years and asked whether some work based on this observation could not be started now. He said that if we waited for 10 years to analyse all statistical data then all the land might be spoiled by that time. Mr. Evershed said that he believed that positive measures of amelioration would develop as information came in. Rao Bahadur Asavale pointed out that there was already a large Government organisation in the Development and Research Division and the two Drainage Divisions in Sind and lacs of rupees had already been spent; and that only assistance was asked for. As the work had been started by the Government of Bombay, that Government should continue it without asking for outside help. Sardar Rao Bahadur Bhimbhai Naik doubted very much whether the Imperial Council of Agricultural Research would accept the scheme. Mr. Manohar Dass Kauramal stated that in the Punjab, water-logging in the Upper Chenab area was already serious and the Punjab was studying this. Similar conditions in Sind were work for the Bombay Government. He doubted very much whether this scheme should be recommended to the Imperial Council of Agricultural Research. Mr. Evershed then withdrew.

It was the unanimous opinion of the members of the committee that the scheme should not be recommended to the Advisory Board as it was (1) a continuation of work which was the responsibility of the local Government and which had largely been done by the local Government, (2) it was not strictly speaking a definitely Agricultural Research.

Enclosure III.

Copy of letter from the Chief Engineer in Sind, Public Works Department, Karachi, to the Secretary to Government, Public Works Department, Bombay, No. 156-W/I., dated the 15th June 1935.

I have the honour to refer to correspondence ending with Government endorsement No. 6946/27-I., dated the 4th January 1935, and to state that at the Meeting of the Soil Amelioration Committee of the Crops and Soils Wing

of the Board of Agriculture and Animal Husbandry in India, held at Delhi, in February last, the Chief Agricultural Officer and I brought to the notice of the Committee that our request for a grant from the Imperial Council of Agricultural Research for investigations being carried out by the Development and Research Division in Sind into the sub-surface conditions had been refused by the Bombay Provincial Research Committee. The Members (including the Chairman—Mr. Burt) recognised that it was one of the most important work of this kind ever done or, being done in India and the Committee seemed to consider that request should have been forwarded. The Chairman stated that it was a matter which should be brought to the notice of the Government of India and further remarked that the approval of the Local (Provincial) Committee was not an essential feature as grants were sometimes made by the Imperial Council of Agricultural Research at the request of Local Governments concerned over the heads of the Local Committees. He accordingly suggested that the Scheme for a grant for Sind should again be put up. I attach an extract from the proceedings of the Soil Amelioration Committee in appreciation of the work being done in Sind.

2. The reasons given by the Bombay Provincial Research Committee for not approving of the proposal are as follows :—

(1) That the work is a continuation of work which was the responsibility of the Local Government and which had largely been done by the Local Government.

(2) It was not strictly speaking a definitely agricultural research.

Neither of these reasons is valid.

3. The first objection of the Provincial Committee mentioned in paragraph 2 above was that the Sind Scheme in question is only a continuation of work already done by the Government of Bombay. In this connection, reference is invited to item 3 and 6 of appendix 1, and to the following sentence of paragraph 8 of the Annual Report of the Imperial Council of Agricultural Research for the year 1929 to 1931 :—

> "In the rice-growing provinces specially in Madras and in Bengal, a good deal of work is being done on this crop but there was scope for much more."

It will be easily seen that if a proposed Scheme is a continuation of Scientific work alreay in progress, on which the Local Government has already been spending some amount, it is not only not a disqualification for that work to receive support from the Imperial Council of Agricultural Research, but, on the other hand it would indicate the *bona fide* importance of the Scheme in question and the preparedness of the Local Government to meet with due expectation of the Council in respect of financial co-operation.

4. As to the second objection, *viz.*, that the Sind Scheme in question is not 'a strictly Agricultural Research', the question would arise 'then what is it ?' The investigation into sub-soil conditions and a scientific treatment of the subject of the sub-soil water movement has been undertaken in Sind expressly

on account of the fact that the water-logging caused by the above factors may prevent the progress or even the maintenance of existing agricultural prosperity in Sind and it is beyond question that unless these problems are solved, progress in agriculture in Sind will be at a standstill. Results of the investigations which, to give complete results, must be continued for at least 5 years more, will go to clarify the laws of sub-soil water movement and stagnation, which at present, are very little understood, particularly for flat irrigation commands such as are met within Sind, Punjab, Bengal and other riverain tracts. From this it is hoped to obtain data regarding the dimensions of drainage works which must accompany a large irrigation scheme in a flat province. This information will be useful not only for Sind but in other Provinces of India and probably throughout the World.

5. During the discussion at the Meeting of the Provincial Committee it was argued that the Scheme in question was simply for the collection of data and not for research. Collection of data is a necessary preliminary of any research work and the cost of such data will be found included in almost every research scheme, not excluding the hundred and odd schemes already sanctioned and financed by the Imperial Council during the years 1929-33. The cost of arriving at the conclusion from the data collected, is included in the demand in question and that there must be some delay in starting the formation of such conclusion is already made clear in paragraph 4 of Mr. Hawes' Note, dated 5th April 1934 (Enclosure I).

6. The Scheme in question does not stop with preparing a scientific basis for irrigational drainage alone. It also deals with other problems vital to agriculture such as the classification of plants and shrubs indicating capacity of the soils on which they naturally grow and their relation with the sub-soil water table below. The data collected will also be useful in the reclamation of kalar lands though such a proposal is not included in the Scheme in question.

7. Another point raised in the Provincial Committee was that the necessity for the work arose directly as a result of the Bombay Government's own action and hence the Bombay Government were really responsible for the work. A discussion of this point would lead to an examination of the wisdom or otherwise of carrying out the Lloyd Barrage Scheme ; and a question which is quite beyond the scope of this and in any case irrelevant. Even assuming for a moment that the scientific investigation has arisen out of the results of an ill-conceived project, it is not clear how it can be unworthy of support from the Imperial Council of Agricultural Research is of value as long as it treats a subject of general agricultural interest and treats it scientifically so as to lighten up a dark gap in the present knowledge of the requirements of a very large irrigation scheme. Moreover the fact that drainage is required for the Barrage Canals is not an unexpected eventuality. It is a pre-conceived part of the Barrage Project, amounts for which already formed part of the estimates sanctioned by the Secretary of State for India (known to the Bombay Legislative Council) before the first line was ever put on ground in connection with the construction of the Barrage or the Canals. What is required now, is not a scheme to counteract the unexpected effects of a work already carried out but the best scientific method for utilising amounts already provided in the Barrage

Project itself. The present demand on the Imperial Council is for funds to arrive at such a scientific method. If the Imperial Council does not help, it is more than likely that the Bombay Government will have to carry out this work unaided. *But that fact can be no disqualification if this Research Scheme* is otherwise worthy of support from the Imperial Council.

8. A glance through Appendix I, will show that the Scheme does deserve a grant from the Imperial Council of Agricultural Research inasmuch as—

(1) The problem which it sets out to solve, is one which affects more than one Province ;

(2) That full advantage is being taken of similar investigation already made in the Punjab in this line ;

(3) The land, buildings and superior establishment required under the scheme, is provided by the Local Government, the demand on the Imperial Council being one for equipment and lower and medium staff only ;

(4) The Scheme has been limited to 5 years only, and involves the Council in no pension or other permanent liability ;

(5) The expenditure proposed is not in relief of any normal provincial expenditure ;

(6) The Bombay Government is going to bear a part of the recurring expenditure, and the exact proportion will be subject to negotiations between the Imperial Council and the Bombay Government.

Lastly, the Bombay Government, before asking for a grant for this research, has already done and will be doing a good deal from its own resources towards the same.

9. A glance at Appendix II, will show that the proposed Scheme for a scientific investigation into sub-surface condition is not more distantly related to agriculture than some of the schemes already sanctioned by the Imperial Council, for instance :—

(1) Agricultural Meteorology (Item 31 of years 1929 to 1931),

(2) Locust Research (several items in the four years),

(3) Appointment of Veterinary Research Officers (Item No. 3 of 1931-32),

(4) Research into indigenous drugs and medicinal plants (Item 30-31 of 1932-33),

and so on

10. The investigation into sub-soil conditions, water movement, and the effect of both on drainage schemes and on the conditions of land on the surface is a major scientific research undertaken in connection with Sind Irrigation. Moreover, up to now, there have been no or very few points in regard to which, the Imperial Council of Agricultural Research have extended their patronage to Sind, though it is one of the major irrigation provinces of India.

11. A complete description of the work will be found in Mr. Hawes' Note, dated 5th April 1934 (Enclosure I) and a precis of the work done and remaining to be done is given in Appendix III, and of expenditure incurred and to be incurred in Appendices IV and V.

12. It will be observed from Appendices IV and V, that during the year 1934-35 further expenditure has been incurred and the total Capital expenditure upto the end of the financial year 1934-35 stands at Rs. 3,67,434. In order to complete some of the investigations in hand which it is proposed to do by 30th September 1935—some further expenditure will have to be incurred which will bring the total Capital expenditure upto 30th September 1935 to Rs. 4,08,115. This figure includes all the recurring expenditure also upto that date.

13. In view of the fact that the total Capital cost on 30th September 1935 will stand at Rs. 4,08,115, against Rs. 3.48 lakhs at the end of the financial year 1933-34 when a lump sum grant of Rs. 1.5 lakhs was asked for, the request for lump sum grant is now increased *pro rata* to 1.8 lakhs, or say 2 lakhs.

14. To recapitulate, the grants now asked for are as under :—

	Rs.
(*i*) A lump sum grant of 2·0 lakhs to cover a part of the Capital expenditure of Rs. 4,08,115. No further lump sum grants will be asked for	2,00,000
(*ii*) A grant of Rs. 49,134 to cover the annual recurring expenditure for a period of five years covering the financial years 1935-36 to 1939-40	2,45,670
Total	4,45,670

15. I have the honour to request Government to approach the Imperial Council of Agricultural Research direct without reference to the Bombay Provincial Research Committee for this money and I feel sure the Council will give a sympathetic hearing to the application. The proposal was unanimously passed by the Sind Research Committee and I feel Sind demands, when approved locally, should not have gone to or been turned down by the Bombay Committee.

Extract from the Proceedings of the Soil Amelioration Committee in appreciation of the work being done in Sind.

* * * * * * * * *

* * * * * * * * *

" The Committee reviewed the work now being carried on by the Agricultural Department in Sind and by the Research Division of the Irrigation Department and considered this to be of great value. A soil survey has been conducted over the whole Barrage area in which the detailed distribution of

kalar has been noted and a systematic collection of soil and sub-soil samples made. The Committee hope that funds will be provided for a complete chemical and physical analysis of the samples obtained which will form a most valuable record in addition to being an essential preliminary to any extensive reclamation projects. * * * * * * *

* * * * * * * * * *"

APPENDIX I

Imperial Council of Agricultural Research principles adopted as guide when making grants

(*Extract from pages 9 and 10 from the Annual Report of the Council for the years 1929-30 and 1930-31.*)

"(*i*) That the scheme should be of all-India importance or in other words that the problem which it sets out to solve is one which affects more than one province ;

(*ii*) That where a scheme is suggested for one province the possibility of co-operating with adjoining provinces in its prosecution should be explored ;

(*iii*) That, ordinarily, land and buildings required under a scheme should be provided by the Government or Governments concerned, the Council making a grant for equipment and staff alone ;

(*iv*) That all assistance should ordinarily be limited in the first instance to five years and should not involve the Council in any pension or other permanent liability ;

(*v*) That the expenditure proposed should not be in relief of normal provincial expenditure ;

(*vi*) That, ordinarily, the Government or Governments interested in a scheme should bear a part of the recurring expenditure, the exact proportion to depend on negotiation between the Council and the Government or Governments concerned ;

(*vii*) That a scheme other than one submitted by the Government of India or by a Local Government, should, ordinarily, have the support of the Government of the Province from which it emanates."

Nos. (*iii*) and (*vi*) should be considered together. It is not ordinarily desirable that the Council should allow any part of its grants to be utilised for the acquisition of land or the construction of buildings. The chief concern of the Council, is, however, not so much to circumscribe its action within the rigid limits of any rules but rather to judge it on the broad ground as to whether its utility to the Country is such as to justify some relaxation of the two principles mentioned above. Another consideration which weighs with the Council is whether the Province or other authority asking for a grant for a particular piece of research has already done, or is doing something from its own resources towards it.

APPENDIX II

Imperial Council of Agricultural Research

Schemes costing more than Rs. 50,000 sanctioned by the Council during 1929-33.

(Extracts from pages 45 and 46, 38 and 39 and 60 and 61 from the annual reports of the Council for the years 1929-31, 1931-32 and 1932-33, respectively.)

Year and Items Nos.	Names of sanctioned Schemes.	Duration of period	Total amount sanctioned
1929-31.		Years.	Rs.
15	Butler Technological Institute, Cawnpore, for experimental sugarcane plant, non-recurring (1,25,000) Annual recurring (20,000 per annum for 5 years)	5	2,25,000
27	Experimental Sugarcane Research Station in Bihar and Orissa	5	1,60,000
28	Research on diseases	5	1,47,000
29	Botanical Sub-station at Karnal	5	1,34,000
30	Locust Research	2	1,76,000
31	Agricultural Meteorology	5	2,05,000
1931-32.			
2	Sugarcane Research Station in the Bombay-Deccan	5	5,22,000
3	Appointing Veterinary Research Officers	5	5,00,000
4	Investigating in diseases of plants	5	65,000
12	Rice Research in India	5	10,96,000
26	Extension of Locust Research	15 months.	62,000
1932-33.			
7	Locust Research	1 year.	50,000
10	Research at Anand Manufactory of products and bye-products of Milk	3	1,11,000
13	Horticultural Schemes for 5 Provinces	5	3,85,000
15	Dry farming schemes for 4 Provinces	5	6,04,000
16	Tobacco Experts for 3 Provinces	5	1,33,000
30	Research into indigenous drugs of India	5	73,000
31	Research in systematical collection of medicinal plants	5	63,000
	Total for large items only	..	**47,11,000**

APPENDIX III

Statement showing the work done in the Development and Research Division for which a grant is demanded from the Imperial Council of Agricultural Research.

1. Main investigation into Sub-Surface condition in :—

The area commanded by Barrage Zone on the Right and Left Banks—

(1) Area investigated .. .. 11,500 Square miles or (73,60,000 Acres).

(2) The total number of permanent observation pipes fixed is 1,500.

(3) The total number of Temporary and Intermediate Bores is 4,300.

2. Detailed investigation of *kalar* lands in the Barrage Zone both Right and Left Banks—

(1) Area investigated is 2,150 square miles=(13,74,000 acres).

(2) The number of Temporary and Intermediate Bores sunk is 3,600.

3. Soil samples collected .. .. .. 27,000.

4. Samples for which chemical and mechanical analysis have been carried .. .. .. 3,500.

5. Water samples collected .. .. 8,650.

6. Water samples analysed .. .. 8,650.

APPENDIX IV

st March 1935 and probable expenditure to be incurred upto 30th September 1935
ious Main and Detailed Investigations and pipe and well-observation works.

urred upto 31st March 1935			Total expenditure upto 31-3-1935	Probable expenditure after 31-3-35 to 30-9-1935	Grand total	Remarks
932-33	1933-34	1934-35				
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
13,920	..	..	1,38,514	..	1,38,514	
24,747	13,387	37,765	76,797	17,829	94,626	
7,031	5,744	5,259	20,242	4,257	24,499	
6,418	17,052	13,489	36,959	7,529	44,488	
20,900	22,134	22,134	94,922	11,066	1,05,988	
73,016	58,317	78,647	3,67,434	40,681	4,08,115	

APPENDIX V

Recurring expenditure on well and pipe observation work, etc., from 1st April 1935 to 31st March 1936

Nature of work	1935-36	1936-37	1937-38	1938-39	1939-40	Total
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Well and pipe Observation work ..	19,000	19,000	19,000	19,000	19,000	95,000
Water and Soil Tests..	8,000	8,000	8,000	8,000	8,000	40,000
2/3 Cost of Sub-divisional Establishment and Travelling Allowance. ..	22,134	22,134	22,134	22,134	22,134	1,10,670
Total ..	49,134	49,134	49,134	49,134	49,134	2,45,670

ANNEXURE II.

COPY OF LETTER NO. 4399/27-I, DATED THE 28TH FEBRUARY 1936, FROM THE SECRETARY TO THE GOVERNMENT OF BOMBAY, PUBLIC WORKS DEPARTMENT, BOMBAY, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, NEW DELHI.

With reference to paragraph 2 of this Government Letter No. 4399/27-I, dated 15th January 1936 (not printed), I am directed by the Governor in Council to forward herewith a copy of the report submitted by the Chief Engineer in Sind with his letter No. 156 W/1, dated 3rd February 1936 (Enclosure).

2. I am to state that this Government agree in the views expressed by the Chief Engineer in Sind in his report and to request that the Imperial Council of Agricultural Research be moved to sanction the non-recurring and recurring grants of Rs. 2,00,000 and Rs. 2,45,670, respectively, as originally asked for in this Government's letter No. 4399/27-I, dated 14th October 1935 (Annexure I).

COPY OF LETTER FROM THE CHIEF ENGINEER IN SIND, PUBLIC WORKS DEPARTMENT, KARACHI, TO THE SECRETARY TO GOVERNMENT, PUBLIC WORKS DEPARTMENT, BOMBAY, NO. 156-W/1, DATED THE 3RD FEBRUARY 1936.

With reference to the correspondence ending with Government Express letter No. 4399/27-I., dated the 9th January 1936, I have the honour to state

that in paragraph 2 of his letter No. F.-199/35-A., dated the 3rd December 1935 (not printed), the Secretary, Imperial Council of Agricultural Research, has asked for the following information :—

(1) A statement showing the recurring and non-recurring expenditure to be incurred on that portion of the proposed investigation which is specifically covered by the recommendation of the Soil Amelioration Committee of the Crops and Soil Wing of the Board of Agriculture and Animal Husbandry in India, 1935, in regard to the chemical and physical analysis of the soil samples collected in the Lloyd Barrage area ; and

(2) An estimate of the *future* non-recurring expenditure (as distinct from the non-recurring expenditure already incurred) in regard to the general work of water-logging, with principal items on which the money will be spent.

2. From the proceedings of the Soil Amelioration Committee (a relevant extract from which was forwarded to Government with my letter No. 156-W/1, dated the 15th June 1935—Enclosure III, Annexure I), it will be observed that the Committee has recommended that funds should be provided for complete chemical and physical analysis of the samples obtained. By chemical and physical analysis, I take it to be the expenditure which is incurred in the Kotri Laboratory, and the expenditure incurred on collection of the required sub-soil samples for the purpose of such analysis.

3. We have asked for a lump sum grant of Rupees two lakhs (2,00,000) to cover a part of the non-recurring capital expenditure of Rs. 4,08,115 incurred up to 30th September 1935. This figure comprises the expenditure incurred on the main investigation, detailed investigation, pipe observation, chemical analysis and 2/3rd of the cost of the Experimental Sub-Division of the Development and Research Division. No more non-recurring expenditure will be incurred hereafter.

4. Our demand for the recurring expenditure is Rs. 2,45,670. This comprises the proposed expenditure to be incurred on well and pipe observation work, chemical analysis in the Kotri Laboratory, and 2/3rd cost of the experimental Sub-Division up to the year 1939-40.

5. Our original demands as shown in Appendices IV and V to my letter No. 156-W/1, dated the 15th June 1935, (Enclosure III, Annexure I), appear to come within the purview of the recommendation of the Soil Amelioration Committee and as such there is no need for preparing any other fresh statements. Our original demand for the grant of Rs. 2,45,670 for recurring expenditure and Rs. 2,00,000 for non-recurring expenditure should accordingly be adhered to.

6. As regards (2) above, an amount of Rs. 43,085 has so far been spent in the Right Bank Drainage Division on the following works and a further expenditure of about Rs. 50,000 is proposed to be spent on the work of the nature of item No. (1) below :—

Name of work	Expenditure already incurred	Expenditure proposed to be incurred
	Rs.	Rs.
(1) Carrying out detailed investigation in the surface and sub-surface conditions of certain tracts on the Right Bank of the river Indus, where the sub-soil water table is dangerously high	22,737	50,000
(2) Carrying out experiments in order to find out an efficient and cheap means of sealing irrigation channels to prevent seepage which affects large areas of culturable lands ..	20,348	..
Total ..	43,085	50,000

7. No non-recurring expenditure is foreseen at present in the Left Bank Drainage Division.

ANNEXURE III

COPY OF LETTER FROM THE SECRETARY TO THE GOVERNMENT OF SIND, PUBLIC WORKS DEPARTMENT, KARACHI, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, SIMLA, NO. 59-I, DATED THE 17TH JUNE 1936.

With reference to the correspondence ending with their Government telegram No. 59-I, dated the 3rd June 1936 (not printed), I am directed to forward herewith four statements A, B, C and D for a grant from the Imperial Council of Agricultural Research towards the cost of sub-surface investigation work in the Lloyd Barrage area in Sind.

2. Statement A shows the non-recurring capital expenditure incurred and to be incurred. Statement B is for a recurring expenditure during the 5 years—1936-37 to 1940-41. Statements C and D are ancillary to statement B showing the staff required and laboratory equipment, etc., for complete chemical and physical analysis of the samples of soils.

3. I am to add that Mr. W. E. Bushby, I.S.E., Executive Engineer, Development and Research Division in Sind will attend the meeting of the Council.

STATEMENT A

Statement showing the actual expenditure incurred upto 31st March 1936, and probable expenditure to be incurred upto 30th September 1937, by the Development and Research Division on the various detailed investigations

Serial No.	Nature of work	Actual expenditure incurred upto 31st March 1936						Total expenditure upto 31st March 1936	Probable expenditure after 31st March 1936 to 30th September 1937	Grand Total	Remarks
		1930-31	1931-32	1932-33	1933-34	1934-35	1935-36				
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	Cost of detailed investigation work done in classifying *areas of predominant kalar*	..	898	24,747	13,387	37,765	18,000	94,797	26,000	1,20,797	
2	Cost of laboratory staff, etc., for doing *soil and water* tests	..	2,208	7,031	5,744	5,259	6,000	26,242	..	26,242	
3	Collection of data of sub-soil water level Irrigation and rainfall and later of investigating these, *i.e.*, the Statistical part of the Sub-division in the Development and Research Division only, *viz.*, 2/3 cost of Statistical Sub-division	7,520	8,368	8,368	8,368	8,368	8,368	49,360	..	49,360	
										1,76,399	

STATEMENT B

Recurring expenditure on carrying out Physical and Chemical tests on the soils collected from detailed investigation work done on classifying areas of predominent kalar.

Nature of work	1936-37	1937-38	1938-39	1939-40	1940-41	Total
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Cost of Laboratory staff, etc., for doing soil and water tests	8,000	8,000	8,000	8,000	8,000	40,000
2/3 cost of Statistical Sub-division	8,368	8,368	8,368	8,368	8,368	41,840
						81,840

STATEMENT C

Present strength of establishment in Research Laboratory, Kotri, is as under:—

Serial No	Designation	Present pay
		Rs.
1	Senior Graduate Assistant, I/C Research Laboratory ..	125
2	Junior Graduate Assistant	94
3	Graduate Assistant	60
4	Field Assistant	52
5	Counter	30
6	Do.	30
7	Do.	28
8	Do.	27
9	*Khalasi*	18
10	Do.	18
11	Do.	17
		339 p.m.
		Rs. 4,068 per year.

Add Rs. 1,000 for the extra Establishment required to complete the work within 5 years 1,000

The remaining Rs. 3,000 are for apparatus and other materials required for running the Laboratory.

STATEMENT D

Cost of Experimental and Statistical Sub-Division. Estimate for 1934-35.

(Excluding Pay and T. A. of the Sub-Divisional Officer.)

	Rs.
1 Statistician at Rs. 300	3,600
2 Computors (Statistical Assistants at Rs. 100)	2,400
1 Overseer at Rs. 120 Less 10% Rs. 108	1,296
1 Assistant Draftsman at Rs. 80 less 10% Rs. 72	864
2 Tracers at Rs. 60 less 10% Rs. 54	1,296
1 Clerk at Rs. 50 less 10% Rs. 45	540
2 *Khalasis* at Rs. 20 less 5% Rs. 19	456
	10,452
Karachi Local Allowance	1,500
	11,952
Yearly expenditure when 2/3 expenditure is debited to soil investigation work	8,368

APPENDIX XXXVIII

Report of the Soil Science Committee held on 16th and 17th July 1936.

PRESENT :

Sir BRYCE BURT (*Chairman*),
Rao Saheb D. V. BAL,
Mr. J. N. BASU,
Rao Bahadur B. VISWANATH,
Mr. P. H. CARPENTER,
Rai Bahadur W. C. CHOPRA,
Mr. A. P. CLIFF,
Mr. DALIP SINGH,
Prof. N. R. DHAR,
Khan Bahadur M. FATEH-UD-DIN,
Dr. J. C. GHOSH,
Mr. W. J. JENKINS,
Dr. P. G. KRISHNA,
Professor J. N. MUKHERJI,
Dr. NAZIR AHMAD,
Mr. R. L. SETHI,
Dr. F. J. F. SHAW,
Mr. G. T. TAIT,
Mr. H. B. RAJDEV (*Visitor*).
Mr. A. SUBBA RAO (*Visitor*).

The Soil Science Committee met at 3-30 P.M. on the 16th and again at 9-30 A.M. on the 17th July, having been presided over by Sir Bryce Burt on the 16th and Dr. F. J. F. Shaw on the 17th.

Application from the Government of Bombay (for Sind) for a grant of Rs. 4,45,670 spread over five years for sub-surface investigation work carried out in the Lloyd Barrage area in Sind [item 14 (i) of the agenda]. (Appendix XXXVII).

The Committee recommended that Rao Bahadur Viswanath and Dr. Basu should visit Sind and work out a scheme of soil investigation in collaboration with the Director of Agriculture, Sind, Mr. Bushby and Mr. Tamhane. The Committee would welcome the addition of Dr. Mackenzie-Taylor to this Committee if the Sind Irrigation Department so desire. The Committee drew special attention to the methods of study on fundamental subjects such as colloids, base exchange and the soil absorption complex.

Progress report on the scheme for study of soil problems by the Physical Assistant appointed on the staff of the Agricultural Chemist, Bengal, for 1934-35 [*item 14* (*iii*) *of the agenda*].

The Committee pointed out that there is misprint in the first line of Table 3. 0-30 inches should be 0-3.

The Committee noted that depths had been extended to 39 inches as recommended at the previous meeting of the Soil Science Committee. The Committee desired to call attention to the remarks of the Statistician in his note on this report.

The Committee drew attention to the fact that in Table 3 on page 8 weights had been expressed in *seers* and *chattaks* and would recommend that lbs. and decimal fractions of a lb. be used. The Committee called attention to the value of standard error quoted in first table on page 8 which was obviously wrong. The units of measurements in the Tables of physical constants on pages 10 and 11 should be specified more carefully.

With these modifications the Committee approved of the report.

Annual report of the Sugarcane research scheme Bombay-Deccan, Padegaon, 1934-35 [*Subject No. 8-A.* (*ii*) *of the agenda*]. (*Appendix V.*)

The Chairman explained that the Sugar Committee dealt with the work on sugarcane and not with the work on soils and as there was a good deal of work on soils in this report, the report came to this Committee.

It was suggested in the Committee that the availability of phosphoric acid might be determined directly from the plant and the attention of the Officer-in-charge of this part of the scheme was called to this method of phosphoric acid determination.

The Committee suggested that in the data given under Table 1, page 67, the method used for humus determination might be indicated in the report.

The Committee would suggest that in the final report on the scheme the photographs of soil profiles should be accompanied by diagrammatic representation of the profile wherever possible.

The Committee suggested that data should be collected on the degree of saturation and on the silica sesquioxide ratio of the clay fraction.

The Committee desired to record the opinion that more useful work would be done in Committee if reports were circulated in sufficient time for members to have adequate opportunity for studying them.

The Committee warmly commended and approved of the work done in the soil section at Padegaon which appeared to have been conducted on systematic lines and to be of fundamental importance to the study of soil science on an all-India basis.

APPENDIX XXXIX

Note by the Secretary, Imperial Council of Agricultural Research, dated the 9th June 1936, on Subject No. 30 :—Cattle Improvement Scheme initiated by His Excellency the Viceroy.

Attention is invited to the following papers in connection with the subject mentioned above :—

(*a*) Letter No. F. 79|36-Vet., dated 1st June 1936, from the Secretary, Imperial Council of Agricultural Research to all Local Governments and Constituent States of the Imperial Council of Agricultural Research (*Annexure I*).

(*b*) His Excellency the Viceroy's Demi-Official letter to Governors (*Annexure II*).

(*c*) Form prepared by the Animal Husbandry Bureau of the Imperial Council of Agricultural Research for recording services of ' Gift Bulls ' (*Annexure III*).

2. It is to be considered how best (*a*) to develop the campaign inaugurated by His Excellency the Viceroy and (*b*) to devise a suitable method of maintaining a record when the services of the bulls which have been presented are extended to rural areas where records are not usually kept.

3. The scheme will be considered by the Standing Cattle-Breeding Committee, in the first instance, on the 16th July 1936 and its report (*Appendix XL*) will be placed before the Advisory Board in the usual course.

ANNEXURE I

COPY OF LETTER FROM THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, TO ALL LOCAL GOVERNMENTS AND CONSTITUENT INDIAN STATES, NO. F. 79|36-VET., DATED THE 1ST JUNE 1936.

SUBJECT :—*Scheme for the improvement of Cattle in India.*

I am directed to forward for information and such action as may be considered most appropriate a copy of a speech made by His Excellency the Viceroy (*Enclosure I*) on the occasion of his presenting three stud bulls for the improvement of cattle in the Delhi Province. I am also to enclose copy of a note by Colonel Olver, Animal Husbandry Expert to the Council (*Enclosure II*), which describes the scheme which His Excellency has inaugurated. I am also to enclose advance copies of an article by Colonel Olver entitled " The inadequacy of ' Dual-purpose ' animals as the ultimate goal for breeders in India " (*Enclosure III*), which will appear in the next number of " Agriculture and Live-stock in India "*. It is hoped that the note and the article, which enters into a greater detail, will be of assistance to Provincial Agricultural and Veterinary Departments.

2. A number of enquiries have already been received from all parts of India as to where suitable bulls for breeding are obtainable and at what

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*Published in Vol. VI, Part IV, pages 389—396.

price. The type of bull suitable to a particular locality must, of course, depend on the character of the cattle already in existence in the area where the bull is to be located and consequently any such enquiries which may be received by the Council will, as a rule, be passed on to the Director of Agriculture or Director of Veterinary Services concerned for disposal. It is hoped that those officers will be in a position to furnish the required information and, where necessary, to make arrangements for the supply of suitable bulls. It is perhaps desirable to emphasise two points in connection with His Excellency the Viceroy's gift. In the first place, these are not English bulls but are pedigree animals of indigenous Indian breeds which have proved their value to this locality. Secondly, the presentation of these bulls forms only one part of a definite scheme of cattle improvement of which the registration of progeny is an essential feature. It is hoped that where wealthy zamindars and others respond to His Excellency's appeal and make gifts to pedigree bulls for cattle breeding, it will be found possible to organize similar schemes with such modifications as local conditions demand. I am to add that the Imperial Council of Agricultural Research would welcome any publicity which the Local Government can give to the enclosures to this letter, especially if it could take the form of translations into local vernaculars.

Enclosures.—As in letter with 100|50 spare copies for distribution in the Districts.

ENCLOSURE I

Speech by His Excellency the Viceroy on the occasion of his presenting two stud bulls for purposes of breeding in the Delhi Province.

" First of all I want to tell you about a little plan of mine for helping the cultivators of Delhi District. Even if you live in a city or town, I am sure you will appreciate that the cow and the working bullock carry on their patient backs the whole structure of Indian agriculture. They are faithful assistants of the farmer. Without them he can neither till his fields nor carry his crops to the market. His cow is the best doctor for himself and his wife, and above all for his children.

" If you would see your children strong give the mother milk before your child is born and while she is nursing your child ; later give the child all the milk it can consume. Again, what is the use of spending time and money in devising improved agricultural implements if the bullocks are too feeble to pull these better implements. Therefore, my friends, if you would help India, help the cultivator, and one of the best ways to help the cultivator is to improve the breed of cattle all over the country.

" Now let me introduce to you my two distinguished friends. See what noble animals they are ! It is an honour for any man to caress such lovely creatures. Look at his skin—so fine and loose, showing high breeding,—his fine head, his straight back, his shapely shoulder and strong quarters, his strong limbs, big bones, big knees and big hocks. As for milk, the mothers of these bulls have yielded over 5,000 lbs. in a lactation period of less than 300 days."

ENCLOSURE II

Plan for improving cattle in India.

Note by Col. A. Olver, C.B., C.M.G., F.R.C.V.S., Animal Husbandry Expert, Imperial Council of Agricultural Research.

Arrangements have now been completed by the Animal Husbandry Expert of the Imperial Council of Agricultural Research in collaboration with the Director of Veterinary Services, Punjab, to put into operation in Delhi Province the plan for improving cattle in India which has recently been initiated by the presentation by the Viceroy of three pedigree Hariana bulls for the improvement of cattle of villagers in the vicinity of Delhi, and at the Delhi Pinjrapole.

One of these bulls is to be located at the Nangloi veterinary hospital, another at the veterinary hospital at Mahruali, and the third at the Delhi Pinjrapole. The bulls located at the Nangloi and Mahrauli hospitals will be maintained at His Excellency's expense and cared for by stockmen employed by the Delhi District Board and specially trained for such work. The bulls will be under the supervision of the senior veterinary assistant surgeon, Delhi Province, and their services will be free but will be confined to selected cows of good Hariana type. The selected cows and their progeny by these bulls—if approved by the veterinary staff—will be registered and suitably tattooed and the District Board will have the right to purchase any entire males they may require for breeding purposes within the Delhi District at a minimum price of Rs. 100 at two years of age. All approved cows and their progeny by these bulls will be vaccinated against rinderpest free of cost and all inferior males will be castrated.

Lead to other Provinces

The aims of His Excellency in presenting these bulls, are, firstly, to give direct assistance to cultivators in the Delhi Province and, secondly, to encourage the adoption of similar measures in other parts of India for the systematic improvement of live-stock of all kinds by means of organized breeding control, combined with systematic castration and inoculation against disease carried out by suitably organized Provincial Animal Husbandry Departments.

A most important part of all such live-stock improvement measures, if they are to be of lasting value, is accurate registration of the services and of the progeny of improved sires, so that in course of time pedigree stock may become available all over the country which could be relied upon to produce high grade stock suitable for the requirements of the localities concerned. But it must be recognized that without proper feeding and management, particularly of the young stock, it is impossible to produce high grade animals of any kind.

All over the world well-developed pedigree stock are of much greater value than stock whose breeding is not accurately recorded and His Excellency was particular that bulls of high class and known pedigree should be purchased and that they should be permanently protected from rinderpest. He was very interested to learn that as a result of research carried on for many years at the Imperial Institute of Veterinary Research, Muktesar, lasting immunity against rinderpest can now very easily be

conferred on indigenous Indian cattle by means of a vaccine obtained from goats which is so cheap, effective and free from danger that already it has become routine practice in all Government farms and by provincial and state veterinary departments all over India, both for the control of outbreaks and for immunization of indigenous stock.

DAIRY CATTLE

His Excellency was quick to realise that this new method of protection could be of the utmost assistance in improving the cattle of the country. With the risk of death from rinderpest removed it will now be a profitable undertaking for breeders and owners to grow fodder crops and to provide good feeding for breeding females and young stock all the year round, so as to produce better cattle and thus reduce the excessive numbers which in the past were maintained, largely as a reserve against loss from disease.

In presenting a bull to the Delhi Pinjrapole, His Excellency had a similar purpose in view with particular regard to dairy cattle. At this institution careful daily records of all milk yields are regularly maintained, along with accurate registration of the young stock produced, and a regular supply of bulls from good dairy strains of known origin should soon be available for breeding purposes in the vicinity.

If, as His Excellency hopes, wealthy zemindars and others follow his example by presenting and maintaining approved bulls for the systematic improvement of cattle in their villages it should be possible for suitably organized Provincial Animal Husbandry departments to confer great benefit on the people of India at relatively small expense, provided that they have at their disposal adequate numbers of suitably trained subordinate personnel for breeding control and registration of approved stock, combined with systematic and early castration of inferior males and inoculation against disease.

ADDITION TO WEALTH

Experience indicates that organised animal husbandry work along these lines would add greatly to the wealth of the country, but to produce results of lasting value it is essential that arrangements be made to carry on the work from generation to generation without change of policy, starting in areas where conditions are particularly suitable for the rearing of high grade stock of well recognized breeds.

ENCLOSURE III

THE INADEQUACY OF THE "DUAL-PURPOSE" ANIMAL AS THE GOAL IN CATTLE BREEDING IN INDIA.

By Colonel A. Olver, C.B., C.M.G., F.R.C.V.S., Animal Husbandry Expert, Imperial Council of Agricultural Research.

In relation to cattle improvement in India there has been a great deal of controversy as to the lines along which breeding should proceed, and as to the advisability of attempting to breed so-called "dual-purpose" cattle which, in addition to producing working bullocks, would also provide good milch animals.

The general desirability of such a combination is obvious but there has been much difference of opinion as to how far it can in practice be obtained, in one and the same strain, in existing circumstances in India.

In theory almost any type can be evolved by scientific breeding but in discussing this very important question practical considerations must be given full weight and it is very necessary that our views on the subject should be clarified. Before dealing with the position in India it seems necessary moreover to refer briefly to what has been done elsewhere.

What has been done in other countries.

Much play has been made with the so-called dual-purpose Shorthorn breed of cattle of the United Kingdom in the production of which a prolonged attempt has been made, by very expert breeders, to combine high-milking capacity with a capacity for the production of beef of the first quality. That this attempt has not been fully successful after many years of sustained effort, is now widely recognised and now-a-days Shorthorns are divided into two distinct classes, *viz.*, Dairy Shorthorns and Beef Shorthorns, and referred to as separate breeds.

But in any case consideration as to how far this attempt to produce a dual-purpose breed has succeeded is not relevant to a discussion of what is likely to be of practical value in India. The goals are not the same and the conditions under which attempts to reach them have to be made are as the poles apart.

In the so-called dual-purpose Shorthorn the combination desired was milk and beef and it must, I think, be clear that the biological problem involved in reaching this objective is not necessarily the same as would be involved in producing a type of animal suitable at once for milk production and for speed, power and endurance at work.

To produce milk or beef economically, the animal must essentially be of a type capable of efficient conversion of vegetable food-stuffs into fat or muscle and fat, and whether the final product is to be beef or milk the efficient producer must be of a placid, inactive type.

Though the efficient milch cow, in spite of heavy feeding, may appear to be the very opposite of the traditional stall-fed ox the physiological processes involved in the two cases are not dissimilar. She is spare of muscle and body fat simply because the food she consumes and digests mostly goes into the milk-pail.

In both cases what is demanded is highly efficient conversion of food into fat and solids-not-fat to provide protective foods of high biological value for the benefit of the human race and any tendency to hardness and muscular activity, such as is specially looked for by breeders of working cattle, would be a definite defect in milch or beef cattle.

What is required in India.

The type required by purchasers of work cattle in India is essentially different. What they demand is a virile active type capable of prolonged work at as fast a pace as is compatible with the load to be hauled.

Like the thoroughbred race horse such animals require a highly nutritious and highly concentrated ration, to enable them to produce and maintain the speed and intensity of action which is demanded.

It is of course quite possible to produce comparatively slow working bullocks from stock in which a capacity for milk production is to some extent developed but, throughout India, it is generally considered, from

the experience of ages, that a high milk-yield is not compatible with a capacity for fast work. In support of this contention it may be pointed out that as a general rule the fastest and best working breeds of Indian cattle are not good milkers. For example the Amrit Mahal, Tangyan, Malvi, Nagore and Bhagnari working breeds cannot be compared with the Sahiwal, red Sindi and Gir breeds as milk producers, though it is quite true that in most of these breeds fairly good milkers can occasionally be found.

But in any so-called dual-purpose breed, where an attempt has been made to retain two independently transmitted characters on a 50 : 50 basis, much irregularity of breeding is liable to occur. Moreover there must always be a strong tendency for both qualities to remain at a comparatively low level, since advance in either direction has periodically to be checked by the necessity to consider the other factor.

It has been contended that little harm has so far resulted to the capacity for work of certain breeds, in which selection for increased milk yield has been carried on for the production of dual-purpose animals, but the amount of experimentation so far done along these lines has not so far been sufficient to justify formulating a policy, for the ordinary breeder which is contrary to the experience of ages.

Specialization necessary.

Whether marked detriment to a working breed will or will not eventually result from such a policy, no experienced breeder would deny that progress in the production of high grade working or dairy cattle would be much faster were only one factor to be considered.

To produce highly efficient and therefore valuable animals, which will breed true to a particular type, it is in fact necessary to breed intensively for that type, paying due regard to maintenance of constitution but to no other factor ; experience having shown that without concentration on one main factor sustained advance to a high standard is not feasible. Even when they are not mutually antagonistic it is very difficult to breed successfully for a combination of 2 or more characters at one time.

Indeed to obtain satisfactory returns from livestocks, in the sale ring or in competitive production, it is necessary to specialise. Such specialisation may even take the form of cross-breeding, provided that only pure-breds are used on both sides ; as for example in the production of the well-known blue-roan beef cattle and blue Anadusian fowls or when pigs of black breeds are mated with whites in order to produce a type of carcase suited to a particular market.

Organised breeding control particularly necessary in India.

In India, because of the religious objection to slaughter of the cow, which entails breeding from almost every female, strict conformity to a carefully controlled breeding policy, with pure-bred stock, is particularly necessary. Moreover, those who have seen the importance which is attached, by the most successful breeders, to maintaining pace n their working type stock and who know the active type of animal which is demanded by purchasers of bullocks of the essentially working breeds—such as the Nagores, Dhannis, Bhagnaris and Malvis of the north and the Amrit

Mahals, Kangayams and Hallikars of the south—must, I think, realize that it is a physiological impossibility to combine highly specialised activity with really high milk-yields.

General utility breeds.

Nevertheless there are very useful general utility breeds, *e.g.*, the Gir breed of Kathiawar and Western India, individual cows of which are capable of reasonably high yields, which could no doubt be developed. The bullocks are powerful though slow workers and, incidentally have a greater capacity for the production of good beef than any other Indian breed.

Such breeds have a definite value and with the replacement of the fast-trotting bullock by motor transport it is probable that they will become more popular. But the ordinary Indian cultivator, who must get his land ploughed as quickly as possible, after the commencement of the rains, and who has to cart his produce long distances to market, is likely for some time to come to continue to demand quick workers. Further, so long as he is prepared to pay comparatively highly for them, as he does at present, breeders in the natural grazing areas are certain to breed for this market.

There is however no reason to suppose that Gir cattle have ever deliberately been bred on dual-purpose lines. Particularly in their own country they have been bred largely for milk and ghee production and Gir cows are used extensively for this purpose, over a large area, but the ordinary breeder has had to keep his eye on weight and strength for work. Consequently this breed has never been developed to a high level either for milk or for work though I have no doubt that it is the foundation blood which constantly appears in the best dairy breeds of India. Further, as happens in such cases, there is a great tendency for both factors to remain at a moderate level and for breeding to be very irregular.

Inherent in this breed there is undoubtedly a high capacity for milk production and, with intensive breeding, purely for milk, there is every indication that selected strains could rapidly be developed into a highly efficient milch breed ; as has happened in the case of the Sahiwal. So long, however, as it is bred for two distinct purposes the breed is likely to remain merely a useful breed, capable of giving good service to the cultivator but unable to hold its own in competitive commercial dairying or in the market for high grade draught cattle.

In the Hariana of the Delhi-Rohtak-Gurgaon Tract we have another example of a breed in the making of which milk-yield has undoubtedly received considerable attention, probably ever since the days of the Moghul Emperors when large quantities of milk were no doubt required in this area. In more recent times the milking capacity of this breed has again attracted the special attention of breeders because of the high prices which good milch cows fetch. for milk production in Calcutta or Bombay, owing to the increasing difficulty of obtaining good cows nearer at hand. But the bullocks of this dairy type, though useful for work on the land, cannot compare with the powerful Hissar type which are constantly seen on the roads and in Delhi City. Moreover. though they are slow, breeds which have been intensively bred for milk, such as the Sahiwal and the Red Karachi, do in fact produce powerful bullocks whose lack of speed can to some extent be compensated for by the use of larger implements.

Nutritional advantages of using cows' milk.—It is true that in many parts of India the buffalo is the milch animal, but this is largely because it is easier for the milk-vendor to water buffaloes' milk and escape detection and because buffaloes are better able to stand the very unsatisfactory conditions under which cows are usually maintained for city milk production. Moreover, owing to mistaken ideas of the food values of the different constituents of milk, the consuming public demands so-called rich milk, *i.e.*, rich in butter-fat and pays little attention to the proteins and mineral salts which, in reality, are the more valuable part of milk for human nutrition. The feeding value of standard cows' milk, *i.e.*, milk with 3.6 per cent butter-fat, is in fact far higher than that of an equal amount of cream and it would be of great advantage to the Indian people if more attention were paid to the mineral salts and protein, which are contained in whole milk and most of which remains in skimmed or separated milk, than to butter-fat which in a diet, such as most Indian diets, which consist largely of starch and sugar, is not so much needed.

Moreover, modern nutritional research has shown clearly that nothing can replace a due proportion of animal foods, in a diet calculated to develop the human race satisfactorily and to maintain it in health, and that milk is the cheapest and best of these. Whether or not the cow will ever replace the she-buffalo in India to any marked extent it is thus evident that more and better milch animals of all kinds are a most urgent need of India to-day, rural as well as urban. Even in areas where, owing to lack of satisfactory communications or for other reasons, the development of a dairy industry is not at present feasible, if better cows were maintained, it would be possible greatly to improve the family diet and at the same time to preserve the fertility of the land.

High-yielding milch strains essential.

More cows' milk would in fact be an unestimable boon to the whole country but to make dairy farming a paying proposition it is necessary to have highly efficient milch strains, and to maintain such stock at high levels of efficiency it is essential that they shall breed true. The necessity to breed for such high efficiency as is demanded by modern competition indeed makes it imperative to specialise.

In other countries, in order to develop a successful dairy industry, it has been found necessary to segregate out high-yielding strains from existing breeds and to develop them to the highest possible milking capacity, seeing that no dairyman could now-a-days hope to compete satisfactorily without such cattle. The same policy will have to be followed in this country and it is of interest that when Denmark started to improve their cattle, by systematic breeding and recording of milk yields, combined with proper feeding and management, the average yield of their cows was no better than the average milk-yield of milch cows in India to-day. Yet in less than 50 years the average yield of butter-fat per cow has been raised from 88 lbs. to 359 lbs. per annum. Similar marked increases have been affected in the United Kingdom, the United States of America and in fact in all countries where organized development of dairy strains has been carried out on scientific lines, but to do so in India, it will be necessary to have many more sires from high-yielding dairy strains, available all over the country, than are available to-day.

Data given in my note on "The potentialities of pure-bred Indian cattle for dairying and the importance of live-stock and live-stock products in India", published in 1935 show that high-yielding strains of indigenous dairy breeds of pure Indian blood can be produced, in a comparatively few years, by breeding intensively for milk. Already, after only 25 years of careful selection, such cattle can hold their own—in India—with the best European milch breeds, as regards the cost of producing standard milk or butter-fat. They can even compete in economical production of butter-fat with the Indian buffalo, but it must, I think, be obvious that these results could not have been obtained without a policy of breeding—and feeding—intensively for the highest possible milk-yields regardless of the effect on working capacity.

General policy for India as a whole.

For India as a whole, where from times immemorial cattle have usually been bred for speed and working capacity the right policy thus appears to be to continue to breed for work in the natural grazing areas, where the development of a dairy industry on modern lines would not be feasible and concurrently, along with systematic development of a dairy industry to breed in suitable areas strictly for the highest possible milk yields.

That in effect is what is being done by most provincial Governments, though in some cases with the intention of breeding a dual-purposes animal, but there is likely to be a constant drag on the wheels of progress unless a definite policy is adopted, of breeding milking and working types separately. This is necessary in order that breeders can quickly achieve and maintain steady progress in one or the other direction, and so that cultivators can be assured of obtaining the services of high grade sires of the particular type they need.

Incidentally the small cultivator, who only aims at producing general utility animals, would be better able to obtain them if high class sires of the two types were available, for mating with his non-descript stock, than if the services of bulls of only one type were obtainable.

Distinction between general utility and 'dual-purpose' animals.

But it must clearly be understood that animals so produced would not be dual-purposes stock in the strict sense of the word, *i.e.*, stock which could be relied upon to breed true for two main factors at once, in equal degree. In practice breeding for the production of dual-purpose animals is in fact liable to develop into a see-saw ; as A end is raised B end falls and when steps are taken to remedy this, A end falls as B rises and so on, *ad infinitum*. One end or the other is depressed, or if equilibrium is reached it is at a mediocre level of efficiency.

To produce or maintain high grade stock which will breed true it is essential to breed and feed constantly for the very best of a particular type. On the other hand it is only too easy to breed mediocre general utility animals, not of the highest class in either direction, which could never be relied upon to breed true for any factor. Usually too many of this type are produced, even while breeding for a special type, and those who want dairy-cum-work cattle would better be able to obtain them if high grade bulls of the two well-developed types were available.

Official recording and publication of milk yields essential.

Countries which aim at nothing better than dual purposes types cannot in fact hope to compete with countries in which strict specialization is insisted on. Consequently in India, in order to create a market which will enable high grade dairy stock to be produced and maintained —at greater expense than the ordinary breeder can afford—it is necessary to breed such cattle on Government farms and to arrange for the publication of the milk yields of cows of high performance, so that prospective purchasers may know the milking capacity of the stock available.

Conclusion.

In short, the draft cattle of India have long been famous, and we now know that India possesses breeds or stains, selected cows of which could comparatively easily be developed so as to more than hold their own with improved breeds of European origin—in the production of standard milk or butter-fat under topical conditions.

On the other hand, throughout India, owing to lack of strict breeding control and proper feeding and management, there are large numbers of non-descript cattle which are a constant drain on the resources of the country.

Further we know that more and better milk is essential to the health and development of the people and that high-yielding dairy cattle are necessary for commercial dairying. Thus, whatever measures are adopted in Provinces and States for the systematic development of work cattle, it is necessary, in order to produce the numbers of high class dairy sires which are needed, to carry on intensive breeding of dairy cattle, at Central Government Farms, so that authentic records of cows, of known pedigree, may be available. In this connection the official definition of the breed characteristics of some of the best breeds of Indian dairy cattle, which has been taken up by the Imperial Council of Agricultural Research with a view to regular publication of the yields of the best cows, should prove of interest to breeders in and out of India.

But the breeding of draught cattle is essentially a provincial matter and for this the most urgent need is to provide an expert animal husbandry organisation, able to carry on scientific breeding control in the villages, combined with systematic castration and disease control, and to ensure that adequate encouragement is given to the production of fodder crops and the conservation and development of natural grazing areas.

Systematic improvement of cattle along these lines is work in which wealthy zemindars and others might well take an active part by following the example of His Excellency the Viceroy who has presented 3 specially selected pedigree bulls, of pure Indian blood, to be maintained at his expense and utilised free for the service of village cows ; on the condition that they and their progeny will be employed, under suitable control, for the systematic improvement of the cattle of Delhi Province.

But long experience of well-meant attempts at cattle improvement in India shows clearly that the mere provision of a bull is not enough to effect lasting improvement. Sires of known pedigree must be bred, in

adequate numbers, and suitable provision must be made for organized Live-stock Improvement measures to be carried on un-interruptedly from generation to generation. It is for these reasons, and for the systematic development of live-stock industries, that it is so imperative that an expert animal husbandry organization, devoted solely to the interest of live-stock, should everywhere be available—at the Centre and in the Provinces and States—with the necessary power and resources to carry on a well-considered breeding policy and to develop animal industry in all its many branches ; on the lines which have been found necessary and very profitable in the most progressive countries of the world.

As the Viceroy pointed out when presenting three pedigree bulls to Delhi Province, " the cow and the working bullock have on their patient back the whole structure of Indian agriculture ". But to make the cattle of India better able to bear this burden it is necessary to make provision on the above lines for the gradual elimination of useless and inferior animals and to develop the best to the highest possible point of efficiency, for domestic use or for sale. To achieve this breeders of high class stock, both Government and private, should concentrate as far as possible on the breeding of two distinct types, for work or for milk, and should breed systematically and intensively, so that high grade pedigree sires of both of these types may become available to the extent required.

ANNEXURE II.

COPY OF A DEMI-OFFICIAL LETTER FROM H. E. THE VICEROY, TO ALL PROVINCIAL GOVERNORS, DATED THE 2ND JUNE 1936.

As Your Excellency is aware, both in the course of my tour with the Royal Commission on Agriculture in India and in my own country, I have devoted a great deal of thought to the subject of live-stock improvement, and I am most anxious to give any assistance which lies in my power to the development of cattle-breeding in India and the improvement of the fodder supply. I will not now trouble you with the latter question but I am having it considered officially as I feel very strongly that there is no point in trying to improve the breed of cattle if the fodder is not there for their nourishment.

I recognise that much has already been attempted by Your Excellency's Government for the improvement of cattle-breeding and that more would have been done had financial conditions been more favourable. I am anxious now to initiate throughout India a sustained effort to attract that unofficial support and interest in live-stock improvement which is so essential to real progress in every country, and I should welcome your advice and that of your Minister in charge of Agriculture as to the methods by which this object can be attained.

As Your Excellency is aware, shortly after assuming office I presented three stud bulls to the cultivators of the Delhi District and made a general appeal to persons of wealth and standing throughout the country to follow my example, and to give pedigree bulls to such institutions as modernised pinjrapoles, dairy farms, Better Farming Societies and similar organisations of cultivators or to District and Local Boards,

which will undertake to use them under specified conditions for stud purposes. I subsequently drew attention to the importance of certain points which are familiar to all those who have a practical acquaintance with the improvement of live-stock, *viz.*, that the bulls should be chosen with great care and that the fullest possible advantage should be taken of the pedigree stock already available at Government Cattle-Breeding Farms, that they should be of a breed suitable to the type of cow in the district concerned and that records should be kept of the progeny. I also suggested that there should be an option to purchase for breeding purposes the male progeny of the "gift" sires at a reasonable price, and that no effort should be spared to develop a "corps" of pedigree cattle with the object of improving the general standard of the stock of the district.

The appeal which I have made has had, I am glad to say, a certain result. I am in the first place greatly indebted for this to the press, who have given full publicity to my remarks, and who have throughout in many ways given me invaluable support. Another feature which has impressed me, in my examination of the gifts which I have received, or which in response to my appeal have been made direct to local institutions in the various Provinces, is that broadly speaking the response has come from the smaller landowners and from people of quite moderate means.

An arrangement on the lines referred to above offers, in my view, certain definite advantages, and I should welcome any observations on it, and any suggestions for its further development, with which Your Excellency and your Minister for Agriculture may care to favour me. The advantages of the arrangement are patent. It at once ensures an off-take at a reasonable price for pedigree male stock, whether produced by private breeders or on Government Farms, and it should result in a mass effect on the general standard of the village cattle of the country especially in villages outside the best breeding areas, whilst the dedication of the best male stock for breeding purposes is in accordance with ancient traditions. If as I trust Your Excellency and your Government share my view on this subject, I should be grateful if you would take such steps as are practicable and desirable to encourage in your Province a campaign on the lines I suggest. I have no doubt that you will enlist the co-operation of the press, and I venture to suggest for Your Excellency's consideration that you might see advantage in communicating my present letter, either as a whole or in part, to the English and Vernacular papers in your Province.

I am fully alive to the importance of enlisting the assistance of District Officers in bringing this subject as a whole, and the specific arrangements I propose, prominently to the notice of the landowners of the country. It has also been suggested to me that, in some Provinces at any rate, it may be possible for the Court of Wards to set an example to the other landlords of the Province as they have already done in the introduction of improved seed and other important agricultural improvements.

I should be grateful if you would let me know at the end of three months what response there has been to my appeal and if you will send me a list of the donors and of the sums of money or the number of bulls

which they have given. I have arranged separately for Colonel Olver, the Animal Husbandry Expert of the Imperial Council of Agricultural Research, to give every possible assistance to those Provinces which desire it, especially in the matter of co-ordinating the efforts which are being made and in achieving a systematic basis of selection and maintenance of the bulls purchased or presented. The Imperial Council of Agricultural Research is also circulating to all Local Governments and to those Indian States which are represented on the Council a note on this subject which may be found of use.

Your Excellency may rest assured that I will spare no effort during my period of office to advance, so far as in me lies, the interests of the agriculturist and the welfare of the rural areas. And I would like to say, in closing my present appeal, that there is no way that I can think of in which greater help can be given to the Indian countryside, and to the future of Indian agriculture, than by action on the lines I now suggest. It is my earnest hope that the response to that appeal will be both generous and widespread.

ANNEXURE III.

CATTLE IMPROVEMENT SCHEME INITIATED BY H. E. THE VICEROY.

Breeding Record of 'Gift' bulls.

[N.B.—*This will be got up in book form with 50 copies of page 3 in each book, pages 1 and 2 being printed respectively outside and inside front cover. One book will be used for each bull.*]

Breeding Record.

Name of Bull.................................Breed.........................Date of birth................Donated by ....

Milk yield of dam

Milk							
Days							

Milk yield of Dam's dam

Milk							
Days							

Yield of Siro's dam ..

Milk						
Days						

Name and Breed of cow served.	Name of Owner of cow.	Yields of Cow.				Date of Service.	Date of Calving.	Sex of Calf.	Name of calf and how disposed of.	Yields of daughters.				Daughter-Dam Difference.	Remarks.
		Milk.	Milk.	Milk.	Milk.					Milk.	Milk.	Milk.	Milk.		
		Days.	Days.	Days.	Days.					Days.	Days.	Days.	Days.		

APPENDIX XL.

Poceedings of the meeting of the Standing Cattle Breeding Committee appointed by the Imperial Council of Agricultural Research held at the Legislative Assembly Building, Simla, at 3 p.m. on Thursday, the 16th July 1936.

The following were present :—

1. Colonel A. Olver, *Chairman*,
2. Mr. E. J. Bruen,
3. S. Datar Singh,
4. Khan Sahib Ch. Dost Mohammad Khan,
5. Mr. T. J. Egan,
6. Mr. B. N. Iyengar,
7. Mr. K. P. R. Kartha,
8. Mr. P. J. Kerr,
9. Mr. Zal R. Kothavalla,
10. Mr. R. W. Littlewood,
11. Pattagar of Palayakotai,
12. Mr. C. H. Parr,
13. Mr. T. F. Quirke,
14. Major P. B. Riley,
15. Mr. C. B. Samuel,
16. Mr. S. M. A. Shah,
17. S. Santokh Singh,
18. Mr. J. V. Takle,
19. Mr. F. Ware,
20. Mr. R. C. Woodford,
21. Mr. A. C. Aggarwala, *Secretary*.

Visitors.

1. Mr. E. S. Farbrother,
2. Khan Bahadur Maulvi Fateh-ud-din,
3. Rai Sahib S. Ghosh,
4. Mr. D. N. Khurody,
5. Mr. J. McDougall,
6. Mr. K. P. Pillai,
7. Mr. D. R. Sethi,
8. Dr. Burch H. Schneider,
9. Mr. V. L. Wazir,
10. Mr. B. K. Badami,

Cattle Improvement scheme initiated by His Excellency the Viceroy. (Subject No. 30 on the Agenda for the Advisory Board.) (Appendix XXXIX.)

The Chairman invited the members to give expression to their views as to the best way of implementing His Excellency's Cattle Improvement Scheme so that the work might be carried on indefinitely.

Mr. Quirke said that in his opinion wide publicity was of great importance, particularly amongst the villagers and to that end he had already issued circulars to Deputy Commissioners in the Punjab asking them to prepare lists of large land-owners. He proposed to approach them direct with the help of Veterinary Assistants. In the Dhanni tract a subsidy scheme was in operation but there was no pedigree registration at present. The Co-operative Cattle Breeding Societies maintained proper registers and he had already put up proposals for appointing Cattle Breeding Inspectors for the purpose.

Mr. Bruen informed the Committee that a Cattle-breeding Society was started in Sir Leslie Wilson's time with the Minister as Chairman and himself as Secretary and that the Bombay Government had recently started a fund out of which bulls were to be purchased and maintained.

Colonel Olver pointed out that the main problem at present was to get suitable pedigree bulls and arrangements must first be made to produce them at suitable centres.

In connection with maintaining of continuity in Cattle Improvement Mr. Woodford suggested that provincial live-stock or cattle-breeding societies should be started on the lines of horse-breeding societies, *the members of which could be graded into different classes, viz.*, those that would give and maintain pedigree bulls, those who would only present bulls and those who would only give cash donations.

Mr. Littlewood felt that the proper maintenance of records would be difficult at present.

Mr. Parr said that in the United Provinces farm-bred bulls were concentrated at certain centres although no pedigree records were kept. It was, however, proposed to start keeping records from this year. In villages cattle-breeding funds were started and from the proceeds, bulls, veterinary instruments, medicines, castrators, etc., were purchased. This was a public fund. At district headquarters district cattle-breeding committees with Deputy Commissioners as Chairmen would be set up and later it was proposed to constitute cattle-breeding boards composed of Government officials and other representatives of the interested public as members. Those who wanted to give bulls would be requested to give money instead and that the Government would arrange for their supply and maintenance. If bulls were to be presented they would have to be properly inspected as to their suitability for stud work.

Mr. Sethi said that little had been done in Bihar except the distribution of bulls from Government farms. It was now proposed to start a central fund and to concentrate work under controlled conditions. He considered that the District Boards should contribute towards the maintenance, etc., of bulls and that an equal share should be met by the Local Government. He hoped to register pedigree stock in the future.

Mr. Kerr said that in Bengal a grant of Rs. 1¾ lakhs had been made from the Village Uplift Grant and 1,000 bulls were being purchased and distributed in lots of 100 in certain areas. These latter were further divided into lots of 10 for distribution in suitable areas on certain conditions; *viz.*, that sufficient services should be given to village cattle, that the bulls should be maintained in satisfactory condition and that neighbours should agree to castrate all scrub bulls in the village. This grant would finish in two years' time but he hoped that they might be able to obtain further grants. Regarding donations he was of opinion that cash for starting a central fund would be of more practical value than bulls. To make a beginning in the way of registration he said that the 200 Government cattle kept in the Jails might be registered and that the 4 pinjrapoles in the Presidency might be utilised for this purpose. This start in registration would be further supplemented by rescuing some of the good cows which were at present sold to butchers in Calcutta after one lactation in the City. But his main difficulty was an Animal Husbandry organisation and adequate staff.

The Pattagar of Palayakotai described through his interpreter the local scheme that had been in force in Coimbatore District during the last 2 years. The Government had given Rs. 2,000 and the District Board Rs. 3,000 per annum for the purchase of 25 bulls, each of which was intended to cover 60 cows. After 2 years the bull became the property of the person who kept it. No other bulls were kept in the district and about 3,000 calves were produced through these District Board bulls.

Mr. Takle said that in the Central Provinces it was proposed to establish controlled breeding centres along with a central fund into which all donations for the purchase and maintenance of bulls should go.

Sardar Datar Singh said that in his district (Montgomery) useless stock was castrated by law. The district was divided into 2 areas, *viz.*, for the breeding of Sahiwals and Hissar cattle; each tenant paid Rs. 2 and the District Board paid another Rs. 3,000 a year. This money was spent on the purchase of bulls and their maintenance. Pedigrees were maintained and that the Patwaris kept the records. This scheme had already been introduced in 4 villages and the people liked it. Mr. Ware suggested six points for the consideration of the Committee and it was decided to make the following recommendations to provinces in regard to His Excellency's Cattle improvement scheme :

(1) That to ensure a continuous supply of pedigree or approved bulls it was necessary to establish pedigree breeding in selected areas ;

(2) That arrangements should be made for the registration of the accredited progeny of approved bulls in suitable breeding areas. For this purpose an adequate provincial organization and more staff were essential. The help and co-operation of Pinjrapoles and *Gowshalas* should be enlisted as far as possible ;

(3) That for the maintenance of bulls it was necessary to establish funds, the proceeds of which should be spent partly for the purchase of bulls and partly for their maintenance ;

(4) That interest of the ryot in cattle improvement required to be aroused by such measures as the formation of a cattle-breeding societies, periodical cattle shows and the award of prizes and sanads to those who had taken special interest in cattle breeding.

(5) That arrangements should be made for the castration of inferior stock in areas where approved bulls were at work.

(6) That in order to encourage people to take interest in pedigree stock it was advisable to give permanent protection against Rinderpest to all registered stock free of cost.

After discussion it was agreed that for every 50 bulls one suitably qualified inspector and subordinate staff would be required.

The meeting adjourned at 4.45 P.M. to meet again at 9.45 A.M. on the 17th July 1936.

17th July, 1936.

In continuing, the Chairman said that he would like to refer to one matter arising out of yesterday's meeting. The Committee had already agreed that cattle-breeding societies should be formed and that the improvement of dairy cattle would have to be carried out largely at Government and similar farms where accurate recording was feasible. It was, however, His Excellency's desire that such work should be done on a more extensive scale and he suggested that official milk recording might be instituted by provincial Cattle-Breeding Committees and carried out under official control. As the time at the disposal of the Committee was short he requested members to let him have brief notes before leaving Simla indicating how far they thought this could be satisfactorily carried out.

Application from the Government of Travancore for a grant of Rs. 2,89,136 spread over ten years for a scheme for improving the cattle in the west coast of India. (Subject No. 6 on the Agenda for the Advisory Board.) (Appendix XLI.)

The representative from Travancore introduced the scheme. After discussion the Committee was of the opinion that it could not be financed by this Council because (1) it would be a repetition of what had already been done, (2) it lacked a sufficient research aspect, and (3) it was not of all-India importance. It was pointed out that adequate information was not given as to the provision for supervision of the work.

Application from the Government of the Punjab for a grant of Rs. 15,000 for sending an officer of the Punjab Veterinary Service (Class I) on deputation to South Africa to study the "Angora" Goat-Breeding Industry. (Subject No. 5 on the Agenda for the Advisory Board.) (Appendix XLII.)

Mr. Quirke made it clear to the Committee that the Punjab Government had no particular man in view in this connection and that the final selection could be made by the Imperial Council of Agricultural Research.

After some discussion the Committee agreed to support the scheme provided that the Provinces, likely to benefit by it (North-West Frontier Province, Punjab, Kashmir and the United Provinces) would

agree to contribute half the total cost, the other half being met by the Imperial Council of Agricultural Research.

Annual report for 1935-36 (fifth year) on Mr. Slater's scheme for the improvement of goats in the United Provinces. [*Subject No. 9 (v) the Agenda for the Advisory Board.*] (*Appendix IX.*)

The Chairman said that the extension of the scheme had already been agreed to and the Committee had only to consider the annual report.

Mr. Egan explained that the Provincial Government had aided the work to the extent of about Rs. 800 or 900 for rearing young kids. The goats were all tested for *Brucella* infections every 3 months and in the last test all were negative.

In answer to an enquiry Mr. Quirke stated that in the Punjab all reactors were slaughtered but recently the reactors had been retained in order to study the disease.

It was agreed that as the herd at Etah was clean it would suffice to test them every six months, in future.

It was pointed out that on page 18 under " Summary and Conclusions " item 2, " The average maximum yield per day " should read " The average yield at the peak per day ".

Mr. Bruen mentioned that the goats sold to his province were not pedigree goats. The Chairman undertook to enquire into this. Mr. Badami wanted the prices at which goats were supplied to be given in the report and Mr. Shah suggested that each province should be given a due share, otherwise he would be willing to buy them all.

The Committee was of the general opinion that the work was being carried out on very satisfactory lines and recommended that the report be adopted.

APPENDIX XLI.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 17th June 1936, on Subject No. 6 :—Application from the Government of Travancore for Rs. 2,89,136 spread over ten years for a scheme of Cattle Improvement.

Attention is invited to the enclosed copy of a letter No. 2757 of 35|Devpt., dated the 2nd December 1935 (Annexure I), forwarding a scheme (Annexure II) for the improvement of cattle in the Travancore State. The scheme involves an estimated cost of Rs. 2,89,136 (Rs. 25,000 non-recurring and Rs. 2,64,136 recurring) spread over a period of 10 years. The Council has been asked for a grant of Rs. 1,57,400—the balance to be met by the Travancore Government. The scheme was placed before the Cattle-Breeding Committee and the Advisory Board in February last but its consideration was postponed at the request of the Travancore Government owing to the inability of their representative to attend the meeting. As the Travancore representative has now expressed his willingness to attend the forthcoming meeting of the Board, the scheme will be placed before the Cattle-Breeding Committee of the Council on the 16th July 1936, and its report (Appendix XL) submitted for the consideration of the Advisory Board in the usual course.

ANNEXURE I.

COPY OF A LETTER No. 2757 OF 35|DEVPT., DATED THE 2ND DECEMBER 1935, FROM THE CHIEF SECRETARY TO GOVERNMENT, TRAVANCORE, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

With reference to your letter No. F. 2 (10)-35|G., dated the 2nd October 1935 (not printed) I have the honour to forward herewith a Scheme for the improvement of cattle in the State, for consideration at the thirteenth meeting of the Advisory Board of the Council proposed to be held from February 10th to 15th, 1936.

ANNEXURE II.

A SCHEME FOR THE IMPROVEMENT OF CATTLE IN THE WEST COAST OF INDIA.

The prosperity of the Indian agriculturist is intimately bound up with that of his cattle. Bullocks supply him with the motive power for all operations,

be it at the plough, or the cart or the waterlift. Other sources of power exist only in very few places and even these are not cheap enough for agricultural purposes. Their installation is further prohibited by the small holdings and meagre resources of the average ryot. Hence he will have to depend upon his bullocks for a long time to come. The cows which breed these bullocks yield also milk which together with its products constitutes almost the only animal food most Indians consume.

2. Cattle of the West Coast are however notoriously poor. The cows are poor milkers. They do not yield sufficient milk for domestic comsumption, which in consequence is a deplorably rare luxury for the majority of the poor people. The bullocks are very puny and weak and on this account, the ryot is generally unable to adopt and make use of many of the modern, efficient and labour saving implements which are now so plentiful in the markets. He has to stick to his crude oil implements which work more slowly and less efficiently at a higher cost. Any serious effort to improve agricultural practices must therefore embrace the restocking of the country with a better breed of cattle. The problem of live-stock improvement is of vital importance and has to be tackled with all earnestness.

3. The cattle in the country may be improved either by replacing the stock with superior breeds imported from foreign countries or by selecting the best among local cattle and grading them up. The results of experiments carried out in various parts of India in the past have proved that it is unwise to import foreign cattle. The climate of the country is very trying, under which conditions imported animals are readily attacked by several malignant diseases, and they rapidly deteriorate or even die. Hence the only alternative is to grade up the local stock.

4. There exist in India several good breeds of fairly satisfactory dual purpose animals. Of these the Sindhi has been found to be the best adapted to the West Coast conditions. Cattle of this breed have been successfully ntroduced into all the West Coast Districts. There exist small herds of dairy cows of this breed in all experiment farms along this coast. The bulls siring these herds have been serving local cows also and the progeny has always been very satisfactory.

5. Though Sindhi Cattle have thus proved themselves admirably adapted to West Coast conditions, there has never been any organised effort to grade up local cattle. Breeding work was neither systematic nor continuous. There were too few good bulls in any tract and even where they were available, all cows were not brought to them ; not even the same cow on all occasions. There were a host of scrub bulls roaming about in country herds and these served even the progeny of the crosses. Thus any improvements resulting from the crossing was allowed to dissipate. It is, th refore, proposed now to start systematic breeding work in a selected area and let it radiate out in an ever widening circle.

6. For several reasons, the Municipal Town of Trivandrum will be the best centre to start this work. The cows maintained within this area are better than local cows to be found anywhere else as their well-to-do owners select the best from all over the country. These cows are better fed and more sani tarily housed than elsewhere. The owners may be expected to realise more readily the advantages of a good sire and may therefore heartily co-operate with the scheme by voluntarily ridding the area of all scrub bulls and by putting themselves to some trouble and even expense to get their cows served by good bulls. The progeny may thus be kept pure and dissipation of results avoided. In any case of emergency, the Municipal authorities may be counted upon to help the scheme by introducing and enforcing necessary legislation.

7. The work is proposed to be started with 25 selected Sindhi bulls and 12 cows. A census of all the local cows within the Municipal limits will be taken and an area marked out within which there will be about 1,500 cows Arrangements will be made with the owners to improve the feeding and housing of these cows wherever necessary. All scrub bulls within this area will be castrated. A pair of bulls will be stationed in each of 12 stalls to be specially constructed for them in different parts of the area taken up for work. Each pair of bulls will be in charge of a keeper and all these together under a Sub-Inspector. The cows will be stationed in the farm to be established outside the Municipal limits. One of the bulls will also be stationed in this farm, which will be under another Sub-Inspector. An Overseer with some training in Veterinary matters will look after the health of the animals, calling in the assistance of the officers at the Trivandrum Veterinary Hospital in all serious cases. A Senior Agricultural Inspector with special training and experience in live-stock work will be put in charge of the whole scheme.

8. Every succeeding year four new bulls will be imported to supplement the stock and replace those which are worn out. The bull calves born on the farm will also be carefully reared up to serve as breeding bulls. Two new stalls will be constructed in each year and four fresh cows added to the stock at the farm. The sphere of operations will be steadily expanded as the strength of the stock increases. A regular herd register will be maintained for all the cows and their progeny and the bulls will be shifted each year from one stall to another in a regular cycle.

9. A statement showing the cost of working the scheme for the first ten years of its operation is appended (Annexure III). The stalls are to be built within the Municipal limits and hence the sites will be rather costly. The sites for the farm and stalls will together cost

Rs. 55,000, the buildings and equipments Rs. 9,950, the live-stock Rs. 22,450, the salary and allowances to the staff Rs. 76,736 and the maintenance of the stock Rs. 1,05,000. A provision of Rs. 20,000 is made for various contingent expenditure making a total of Rs. 2,89,136 for the 10 year period.

10. This is a noval experiment, the results of which will be of immediate practical benefit to the whole of the West Coast. It is certain to lead to many scientific observations which will be of even wider and more general application.

11. The Travancore Government will provide the sites for the farm and the stalls and meet the cost of the staff, which together aggregate to nearly one half of the total cost. It is requested that the Imperial Council may be pleased to sanction a research grant of Rs. 1,57,400 spread over a period of ten years to provide the balance of the funds required for the work.

ANNEX

Statement of costs for working

Nos.	Items.	1st year.		2nd year.		3rd year.		4th year.	
		No.	Cost Rs.	No.	Cost Rs.	No.	Cost Rs.	No.	Cost Rs.
	Land and buildings.								
1	Site for the Farm 25 acres at Rs. 100 ..	250 acres	25,000	..	..	..	..	..	—
2	Site for bull stalls at Rs. 1,000 each ..	12	12,000	2	2,000	2	2,000	2	2,000
3	Bull stalls at Rs. 150 each	12	1,800	2	300	2	300	2	300
4	Cow shed	1	1,000	..	200	..	200	..	200
	Live-stock.								
5	Breeding bulls at Rs. 250 each	25	6,250	4	1,000	4	1,000	4	1,000
6	Cows at Rs. 150 each	12	1,800	4	600	4	600	4	600
	Staff.								
7	Agricultural Inspector on Rs. 150 per month.	1	1,800	1	1,800	1	1,800	1	1,800
8	Sub-Inspectors on Rs. 50 per month ..	2	1,200	2	1,200	2	1,200	2	1,200
9	Overseer (Veterinary) on Rs. 20—1/2—25 per month.	1	240	1	240	1	252	1	252
10	Clerk on Rs. 20—1/2—25 per month ..	1	240	1	240	1	252	1	252
11	Peons on Rs. 9—1/6—11 per month ..	2	216	2	216	2	216	2	216
12	Bull Keepers on Rs. 10 P. per month ..	14	1,680	16	1,920	19	2,280	21	2,520
	Allowance.								
13	Travelling allowance to the staff ..	..	500	..	500	..	500	..	500
14	Cycle allowance to the Overseer	..	120	..	120	..	120	..	120
15	Office rent	..	300	..	300	..	300	..	300
	Equipments.								
16	Furniture, Vessels, etc... ..	..	300	..	150	..	150	..	150
17	Books and Periodicals ..	..	100	..	100	..	100	..	100
18	Contingencies .	..	2,000	..	2,000	..	2,000	..	2,000
19	Feeding charges	..	6,000	..	7,000	..	8,000	..	9,000
	Total for the year	..	62,546	..	19,886	..	21,270	..	22,510
	Grand total to the end of the year ..	..	62,546	..	82,432	..	1,03,702	..	1,26,212

URE III.

the Cattle Improvement Scheme for ten years.

5th year.		6th year.		7th year.		8th year.		9th year.		10th year.		Total Rs.
No.	Cost Rs.	No.	Cost Rs.	No.	Cost Rs.	No.	Cost Rs.	No.	Cost Rs.	No.	Cost Rs.	
..	..	..	..	..	..	..	..	..	..	..	..	25,000
2	2,000	2	2,000	2	2,000	2	2,000	2	2,000	2	2,000	30,000
2	300	2	300	2	300	2	300	2	300	2	300	4,500
..	200	..	200	..	200	..	200	..	200	..	200	2,800
4	1,000	4	1,000	4	1,000	4	1,000	4	1,000	4	1,000	15,250
4	600	4	600	4	600	4	600	4	600	4	600	7,200
1	1,800	1	1,800	1	1,800	1	1,800	1	1,800	1	1,800	18,000
2	1,200	2	1,200	2	1,200	2	1,200	2	1,200	2	1,200	12,000
1	264	1	264	1	276	1	276	1	288	1	288	2,640
1	264	1	264	1	276	1	276	1	288	1	288	2,640
2	216	2	216	2	240	2	240	2	240	2	240	2,256
24	2,880	26	3,120	29	3,480	31	3,720	34	4,080	36	4,320	30,000
..	500	..	500	..	500	..	500	..	500	..	500	5,000
..	120	..	120	..	120	..	120	..	120	..	120	1,200
..	300	..	300	..	300	..	300	..	300	..	300	3,000
..	150	..	150	..	150	..	150	..	150	..	150	1,650
..	100	..	100	..	100	..	100	..	100	..	100	1,000
..	2,000	..	2,000	..	2,000	..	2,000	..	2,000	..	2,000	20,000
..	10,000	..	11,000	..	12,000	..	13,000	..	14,000	..	15,000	1,05,000
..	**23,894**	..	**25,134**	..	**26,542**	..	**27,782**	..	**29,166**	..	**30,406**	
..	**1,50,106**	..	**1,75,240**	..	**2,01,782**	..	**2,29,564**	..	**2,58,730**	..	**2,89,136**	

APPENDIX XLII.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 17th June 1936, on Subject No. 5 :—Application from the Government of the Punjab for a grant of Rs. 15,000 for sending an officer of the Punjab Veterinary Service (Class I) on deputation to South Africa to study the " Angora " Goat-Breeding Industry.

Attention is invited to the enclosed copy of an application of the Punjab Government (Annexure) that a lump sum grant of Rs. 15,000 be allotted by the Imperial Council of Agricultural Research, for the purpose of sending an officer of the Punjab Veterinary Service (Class I), selected by the Council, on deputation to South Africa to study the Angora goat-breeding industry for a period of six months (including travelling).

2. The Punjab Government had originally applied for a lump sum grant of Rs. 29,000 for sending an officer of the Punjab Veterinary Service (Class I) to South Africa for one year for the same purpose. This scheme was considered both by the Cattle-Breeding Committee of the Council and the Advisory Board in February last. It was recommended that the Council should select an officer and send him on deputation to South Africa for a period of six months, including travelling, to study the industry with a view to developing it in suitable areas in India, and that the scheme should be sent back to the Punjab Government with a view to its reconsideration at the summer session of the Advisory Board.

3. The present scheme has been prepared by the Punjab Government in the light of the recommendations mentioned above. It will be considered by the Cattle-Breeding Committee of the Council on the 16th July 1936 and its report (Appendix XL) will be submitted to the Advisory Board in the usual course.

ANNEXURE.

APPLICATION OF THE PUNJAB GOVERNMENT.

That a lump sum grant of Rs. 15,000 be allotted by the Imperial Council of Agricultural Research, for the purpose of sending an officer of the Superior Provincial Veterinary Service (selected by the Council), on deputation ex-*India for six months, to visit South Africa to study in detail all aspects of the " Angora " goat-breeding industry ; including the commercial aspect of grading and marketing mohair, and to report, for the information of the Government of India, the practicability of establishing the Angora goat in India.*

Extract from paragraph 159 (page 175) of the Report of the Royal Commission on Agriculture in India.

" 159. * * * * * * * * * * * * * * * with the object of improving the quality of the hair, suggestions have been made from time to time that the Angora goat should be tried for crossing. So far as we have been able to discover, this

> has not been done in India, at least on any considerable scale. This breed has been used with highly satisfactory results in South Africa and elsewhere and we recommend trials of it in this country. It may be found possible to grade up the pure Angora strain. In that case, improvement would be easy and straightforward ;" * * * * * * * * * * * * * * * * *

1. So far as can be ascertained, no action appears to have been taken elsewhere in India, on this recommendation of the Royal Commission on Agriculture and there are no records whether the Angora goat has ever been tried in India.

This subject has received some consideration in the Punjab, however, and since as far back as 1924 an officer of the Punjab Veterinary Service has been steadily collecting and examining information with regard to this valuable industry. He has been in touch with the Agricultural Department of South Africa, the Grootfontein School of Agricultural (which is the headquarters of the Angora Goat Expert to the Union Government of South Africa), the South Africa Angora Breeders' Society, and the Angora Goat-Breeder's Stud-book Association, all of whom have been most helpful with information and offers of assistance.

As recently as 1934, the Punjab Government sent this officer on deputation to Bradford—the centre of the world's mohair industry—to investigate the commercial aspect of mohair production, and the future of this textile. His report is both illuminating and encouraging.

After careful consideration of the mass of information now available (full details of which have been supplied to the Animal Husbandry Expert, Imperial Council of Agricultural Research), it is felt that the time is ripe for the next step to be taken towards establishing this valuable industry in India.

From the available data it seems probable, that many suitable places could be found for growing mohair in this country, particularly in North and North-West India. It is also felt that such a venture should promote useful indigenous spinning and weaving industries, and may even ultimately develop into a highly profitable export trade.

It is felt that to import valuable pedigree stock, at considerable expense, without some first-hand experience of what is necessary in respect of soil, climate, feeding, handling, shearing, etc., might easily end in disaster. For this reason it is proposed, that the first stage of the experiment should be, the despatch of an officer on deputation to South Africa, to collect all vital information. On his return, he would report on the feasibility of introducing Angora Goat-Breeding into India, and should this report be favourable, inspect and advise on the suitability of various localities for commencing experiments. He would also be in a position to advise the Central and Local Governments on the financial aspect of schemes for breeding Angora goats.

2. The 'Angora' goat is not a milch goat, its value being in its fleece, which is of very long staple and is known commercially as "mohair". The Angora (or Mohair) goat is one of the two main types of "wool" goat, the other being the Kashmir or "Shawl" goat.

Mohair is generally recognized as one of the most versatile of all known fibres, for which there is no good substitute, neither can it be produced synthetically. For these reasons it has considerable value industrially, and probably explains why the demand for this textile does not appear to be so adversely affected by economic depression as other agricultural products such as wool, cotton, jute, etc. In Bradford it is considered, having regard to cost and proportionate yield, that mohair is certainly the cheapest textile material. The opinion there also is that there is less mohair being grown in the world than the trade can consume in normal times, and the idea of another country taking up mohair growing was received with some satisfaction.

Many authorities hold that the " wool " goats (Angora and Kashmir), owing to their resemblance to sheep, have decended from *Capra falconeri* and not from *Capra aegagrus*, and that their original home was probably Tibet. From this it would appear, that India, with the Kashmir and other species of the " wool " goat readily available, may be able to produce a better cross-bred in a shorter time, than was the case in South Africa where the Angora was crossed with the " milch " goat. An interesting point is the fact that the Turkish mohair grower in Asia Minor commands a higher price per lb. for his fleece, on account of its finer texture, and mohair buyers complain that the South African mohair grower pays too much attention to weight and not sufficient to the fineness and texture of the fleece. In view of the divided opinion as to the origin of the " wool " goat, the real cause of the relative coarseness of the South African fleece, quite possibly may be due to the fact that " milch " goats (*Capra aegagrus*) were used there for cross-breeding. It may therefore be found, that in India with various types of the " wool " goat (*Capra falconeri*) available for crossing, that a fleece equal in quality to the Turkish fleece, can be produced. Cross-breeding with such goats would also probably produce a type of animal which would thrive in a much wider range of climate than the imported Angora.

3. The Angora goat, prior to 1838, was found only in Asia Minor, but South Africa has now the largest mohair export trade in world. In 1932-33 (during the economic depression) the turnover of the industry in the latter country was £2,000,000 sterling or 2½ crores of rupees. This valuable trade has been built up entirely from the extremely small numbers of Angora goats imported from Asia Minor between 1838 and 1880. That is, before the Turkish Government, fearing the loss of their mohair monopoly, prohibited the export of Angora goats from Asia Minor. It may be mentioned that this embargo is still in force and it is now quite impossible to get Angora-breeding stock from Asia Minor.

The Angoras imported in South Africa were interbred to some extent, but were chiefly crossed on the white " Boer " goat. As a result of wise and steady policy of selective breeding, South Africa now possesses an extremely lucrative industry, and the Angora stud herds can be relied upon to throw true to type. By some authorities they are even considered to be the purest breed of Angora goat in the world to-day. The weight of the fleece of the South African Angora goat now averages 8 lbs. against 3 lbs. from the Turkish Angora.

4. When the difficulties faced by the pioneers of the industry in South Africa are considered, there really seems no reason why an equally profitable industry should not be developed in suitable parts of India. Mohair growing could be commenced in this country with many advantages not enjoyed by the South African pioneer, such as :—

(a) The South Africans purchased their original stock from indigenous herds in Asia Minor, kept by an illiterate people who maintained no pedigree records.

For India we can purchase pedigree stock, authenticated by the South African Angora Goat Breeders' Society's Studbook.

(b) In South Africa the pioneers of the industry had no guidance from breeding literature.

In India we should have the benefit of their experience, and the text-books and literature on the subject, produced during the last half century.

(c) The advantages of having indigenous species of the "wool" goat, available for cross-breeding in this country have already been mentioned.

(d) South Africa is one of the most expensive countries in the world.

In India, labour, land, buildings and forage are very much cheaper. The cost and standard of living is also very much lower. Mohair can, therefore, be produced here much more cheaply than in South Africa.

(e) In South Africa, mohair growers have little or no market for the disposal of stock "culled" as not up to breeding standard or because of inferior fleeces. Consequently, some farmers have numbers of uneconomical animals in their herds.

In India, as in Asia Minor, the goat is slaughtered for food (in fact goat meat is usually preferred by the Indian plate) and the trade in goat flesh is very large. The flesh of the Angora goat is extremely tasty, and is known in the trade as "chevon". The Indian mohair grower will, therefore, have a ready market for his casters, which will assist in keeping his mohir herds up to a high standard.

(f) The South African farmer of mohair depends almost entirely on his export trade, and, therefore, suffers when demand falls off and large stocks of mohair accumulate.

In India, the spinning and weaving of goat hair is a long established indigenous industry, wh'ch could be developed to consume all the mohair produced for many years to come.

5. In view of the foregoing it is, therefore, proposed that an officer should be sent by the Imperial Council of Agricultural Research on deputation to South Africa, to complete these investigations and submit a report in due course.

The Principal of the Grootfontein School of Agriculture recommends that the tour should be for a full twelve months in the country, in order to cover every phase of the industry, including the study of soil and climate, mating, kidding, culling, feeding, grazing, shearing, dipping and the observation of the export trade details at the ports during the selling season. The Advisory Board of the Imperial Council of Agricultural Research, however, consider six months, *ex*-India, including travelling sufficient for the purpose.

It has also been recommended that he should visit the Grootfontein School of Agriculture for study and consultation with the Angora Goat Expert ; visit places where Angoras are bred outside the main Angora area, such as Dundee District, Natal and Basutoland, and that he should tour with the Stud-book Inspectors of the Angora Goat-Breeders' Society.

The Angora Goat Expert of South Africa has already been in touch with influential Angora breeders in that country, who have assured him that the officer sent would be most welcome. The Angora Goat-Breeders' Stud-book Association have gladly promised all assistance with regard to demonstrating their methods, and will permit the officer on deputation to accompany their Stud-book Inspectors on tour.

6. The financial aspect of this proposal is as follows :—

	Rs.
(*a*) Return First Class Passage of an officer of the Superior Provincial Veterinary Service, Bombay to Cape Town	1,600
(*b*) Salary, for 6 months, approx.	7,800
(*c*) Deputation allowance at £1 per *diem* for 6 months (figure obtained from South Africa, which is an expensive country) ..	2,440
(*d*) Travelling allowances, fees, films, stationery, etc., in South Africa, say	3,160
Total	15,000

7. It is, therefore, recommended that this sum may be allotted by the Imperial Council of Agricultural Research, as a lumpsum grant for the purpose indicated herein.

APPENDIX XLIII.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 12th July 1936, on Subject No. 13 :—Proceedings of the First Meeting of the Wheat Committee appointed by the Imperial Council of Agricultural Research.

The attached proceedings (not printed) of the first meeting of the Wheat Committee held at Simla on the 10th and 11th July 1936 and the report of the sub-committee (not printed) referred to therein, are circulated to the Advisory Board.

2. Necessary action on the recommendations of the Committee will be taken by the secretariat of the Council in due course.

APPENDIX XLIV.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 17th June 1936, on Subject No. 4 :—Village Enquiry regarding Cattle and the production and consumption of milk.

Attention is invited to the attached copy of a letter to certain local Governments (Annexure I) forwarding a scheme (Annexure II) prepared by the Animal Husbandry Expert, Imperial Council of Agricultural Research at the suggestion of His Excellency the Viceroy. The approval of the Governing Body to the financing of the scheme is being sought by circulation.

2. The scheme is now submitted to the Advisory Board for discussion of technical details.

ANNEXURE I.

COPY OF LETTER FROM THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, TO THE GOVERNMENTS OF MADRAS, BOMBAY, UNITED PROVINCES, PUNJAB, CENTRAL PROVINCES, BIHAR AND DELHI, No. F. 10 (1)|36|V., DATED THE 29TH MAY 1936.

SUBJECT :—*Village enquiry regarding cattle, and the production and consumption of milk.*

I am directed to enclose a copy of the above scheme (Annexure II) which has been prepared by the Animal Husbandry Expert, Imperial Council of Agricultural Research and to express the hope that the Government of $\frac{\text{Bombay}}{\text{etc.}}$ will be good enough to extend their co-operation in working the scheme and to instruct their Agricultural or Veterinary Departments, as the case may be, to make the necessary arrangements. The scheme will be financed by the Council, and the areas selected for the investigation are the following :—

(1) Hariana Tract—Delhi-Gurgaon-Rohtak area.

(2) A tract in the Punjab (Montgomery) in which Sahiwal cattle are bred.

(3) Kosi tract—Muttra and adjoining areas in the United Provinces where Kosi cattle predominate.

(4) Kankrej tract—an area of moderate size in Bombay Presidency where Kankrej cattle are bred by cultivators.

(5) Ongole tract of Madras—area similar to (4) above.

(6) An area in the Central Provinces in which regular crop cultivation and some milk-production by cultivators are carried on.

(7) A suitable 'deltaic' (alluvial) tract in Bihar to be selected by the Director of Agriculture.

2. The arrangements which the Provincial Director of Agriculture or Director of Veterinary Services will have to make are :—

(*a*) To define the area, which should not ordinarily contain more than 2,000 villages.

(*b*) To select at random about 60 villages in each area and 20 holdings in each village, the principle of selection being that explained in Animal Husbandry Expert's note.

(*c*) To make the necessary appointments, *viz.*, 10 Investigators at Rs. 30 per mensem and one Supervisor at Rs. 160 per mensem for each area (Investigators for three months from 1st August 1936 and Supervisors for 4½ months from the middle of July 1936). In selecting Investigators the suitability of those relieved from the Cost of Cultivation enquiry should be considered. The Supervisors should be experienced Agricultural Assistants who have been trained in live-stock work or suitably trained Veterinary Surgeons or the holders of the I. D. D.

(*d*) To inform the District officials of the villages selected for investigation so that the investigators may have access to the necessary village records and all the facilities necessary for their stay in the villages and the collection of data from villagers.

(*e*) To supervise the work generally.

3. If, however, the local Government prefers to carry out the work through a suitable existing organisation (*e.g.*, The Board of Economic Enquiry of the Punjab, Rural Development Staff as in United Provinces and elsewhere) the Imperial Council of Agricultural Research would be prepared to make a grant for the purpose.

4. The favour of an early reply is requested, on receipt of which necessary steps will be taken for the allotment of funds so as to put the scheme in operation from the middle of July next.

ANNEXURE II.

Village Enquiry regarding cattle, and milk production and consumption—scheme prepared by the Animal Husbandry Expert, Imperial Council of Agricultural Research.

At the instance of His Excellency the Viceroy it is proposed to carry out a rapid survey of 7 typical areas in different parts of India, where a definite type of cattle predominates, to ascertain the actual

position as to the amount of land under fodder production, the number of animals maintained and the amount of milk and dairy products produced and how consumed or disposed of.

For this purpose a questionnaire has been drawn out (Annexure III), and it is proposed that work shall be organised in each area on the following plan : Basing our calculations on the number of villages in the Rohtak-Delhi-Gurgaon area, which is being taken as the Hariana Tract, it is proposed to allot 10 Investigators to deal with from 50 to 60 villages, in each area, under the supervision of a Supervisor. The Investigators would remain in each village roughly a fortnight and the Supervisors would be responsible for checking their work, for compiling a suitable report at the end and tabulating the results.

To carry out the actual investigations it is proposed to take on, for 3 months from the 1st August 1936, the required number of the village Investigators, so far as possible who have been employed under the Cost of Cultivation Enquiry, at the same rate of pay, and that each should remain roughly a fortnight in a village and deal with approximately 20 holdings per village. The villages and the holdings to be dealt with would be selected at random by the Director of Agriculture or Director of Veterinary Services concerned in such a way that every village and every holding in the selected area have an equal chance of being represented. The method of randomisation should be that recommended on page 18 of Bowley Robertson Report, which is quoted below :—

> " Briefly it is to make (or rather to use an already made) list of all the units in the aggregate, *e.g.*, of the 86,618 villages of the Bengal Presidency arranged in geographical order of districts, and having decided on the number to be investigated—say 200—to mark in the list one in 433 $= \frac{86,618}{200}$ approx.) throughout. Thus if we begin with the first village, the 1st, 434th, 867th..........86,618th, as counted through the ordered list, would be the villages to be investigated. (It is better, however, not to begin with the first, but with some random number in the first 433) ".

The essence of the method is that there shall be no conscious selection.

The Supervisors will be responsible for organizing and checking the work of the Investigators and for compiling a suitable report at the end. They will be trained for a fortnight, from about the middle of July, by carrying out an actual survey of one or more villages in the Delhi Province, under the direction of a selected official who has experience of this class of work, accompanied by Mr. Kartha of the Animal Husbandry Bureau.

At the end of the 3 months' work the Investigators will be paid off, and the Supervisors will bring their records to the office of the Imperial Council of Agricultural Research at Delhi, for the purpose of compilation. It is anticipated that this will take roughly a month to complete.

The estimated cost of the scheme is shown in Annexure IV attached.

ANNEXURE III.

Questionnaire for each Farmer.

Province........................ District............ Village....................

Name of the Farmer and caste................ Total area of his cultivation..............

Irrigated or unirrigated. ——————— Area irrigated................

Sources of irrigation. .... Area irrigated from wells........

....

....

....

Area under each crop.	1.	7.	13. ....
(To be compiled from	2.	8.	14. ....
village records).	3.	9.	15. ....
	4.	10.	16. ....
	5.	11.	....
	6.	12.	

Total area sown— *Kharif*..................

Rabi..................

Total..................

Number of ploughs......................

---

1. *Members of family*.—(Total number living in one homestead and dependent on the holding).

	Male.	Female.
(*a*) No. of adults	....	....
(*b*) No. of infants 0—3 years	....	....
(*c*) No. of children from 3 years to 10 years.	....	....
(*d*) Total..........................	....	....

2. *No. of work animals maintained.*
   (*a*) Bullocks.
   (*b*) Male buffaloes.

3. *No. of cows maintained.*
   (*a*) of draught breed (name breed)..................
   (*b*) of milch breed (name breed)..................
   (*c*) No. of calves at foot—(1) Male. Draught...... Milch......... (2) Female. Draught......... Milch.........

4. No. of she-buffaloes maintained......................(state breed)...................

   No. of buffalo calves................ Male. Female.

5. No. of goats maintained for milk........................

6. Milk production statistics, of (give particulars of each animal).

		Date of calving (approx. if purchased with calf).	Actual milk yield (lb.) per day.	No. of months in milk.	Estimated yield of lactation.	No. of months dry prior to calving.
3. (*a*) Cows of draught breeds.	1.					
	2.					
	3.					
3. (*b*) Cows of dairy breed	1.					
	2.					
	3.					
4. *Buffaloes.*	1.					
	2.					
	3.					
5. *Goats.*	1.					
	2.					
	3.					
	4.					
	5.					

7. *Statistics of production and consumption of milk, butter and ghee.*

	For each day of seven consecutive days.						
Milk (in lb. and oz. per day).	1	2	3	4	5	6	7
Produced (including estimated calf's share).							
Consumed at home							
Total fed to calves (whole milk only) ..							
Sold							
Purchased							
Converted into butter (where made) ..							
Converted into ghee							
Butter (in lb. and oz. per day) where butter is made.							
Produced							
Purchased							
Consumed fresh							
Converted into ghee							
Ghee (in lb. and oz. per day).							
Produced							
Purchased							
Consumed							
Sold							

8. Amount allowed to each calf per day and the period for which milk is given.

(a) Male calf. { Draught / Milch } ....

(b) Female calf. { Draught / Milch. } ....

9. Source of purchased milk (if any). (Name the class or classes of suppliers)................

10. Quantity of Condensed Whole Milk purchased (if any)....................................

11. Quantity of Condensed Separated Milk purchased (if any)................................

12. Where and to what class of customer are the following sold. (If no sales are made enter nil):—

Milk...

Butter...

Ghee...

13. Proportion consumed by :—

	Adults.	Children. 3—10 years.	Infants. 0—3 years.
Milk			
Butter			
Ghee			
Condensed Whole Milk			
Condensed Separated Milk			

14. When none of the farmer's cows or buffaloes are in milk—

(a) Does he purchase any milk ?..

(b) What is the source of purchase ?...

(c) How much is purchased per day ? (lb.)....................................

(d) How much of this is consumed by :—

(1) Infants 0—3 years...

(2) Children 3—10 years...

(3) Adults...

(To be printed inside front cover of book for each village).

General Abstract for Village.....................................

Area .. .. { Irrigated...
Unirrigated...
Uncultivated..
Fallow..
Total... }

Human population .. { Infants. 0—3 years.................................
Children. 3—10 years.................................
Adults. Over 10 years................................ }

		Cattle.	Buffaloes.
Cattle Population ..	Breeding Bulls		
	Working Bullocks		
	Bulls and Bullocks not used for work or breeding		
	Breeding cows		
	Cows used for work		
	Cows not used for work or breeding		
	Young-stock males under three yea[rs]		
	Young-stock females under three years		

ANNEXURE IV.

Estimated cost (of 7 areas) of Village Enquiry regarding cattle, and milk production and consumption.

	Rs.
70 Village Investigators @ Rs. 30 per mensem for 3 months	6,300
7 Supervisors @ Rs. 150 per mensem for 4½ months	4,725
Travelling allowance calculated roughly at Rs. 75 and Rs. 10 per mensem for Supervisors and Investigators respectively for 3 months	3,675
Contingencies	600
	15,300
Headquarters tabulating staff, etc. (say) ..	1,200
Total ..	16,500
Approximate cost per area (excluding Headquarters expenses)	2,186

APPENDIX XLV.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 22nd June 1936, on Subject No. 32 :—Application from Lt.-Col. R. N. Chopra, School of Tropical Medicine, Calcutta, for an additional grant of Rs. 13,200 spread over three years to expedite work in connection with the study of Medicinal Plants and Food poisons in India.

In July 1932 the Advisory Board recommended a scheme of research in systematic cultivation of medicinal plants and study of food poisons by Lt.-Col. R. N. Chopra, at a cost of Rs. 62,860 spread over five years (pages 31—33, 43, 309—324 and 437-438 of printed proceedings of the Board). The scheme was sanctioned by the Governing Body in October 1932 and started with effect from April 1935. The first progress report on the scheme has been submitted to the Board separately.

2. Col. Chopra has now applied for an additional grant of Rs. 13,200 spread over three years for expediting the work on the scheme (Annexure). The additional grant is meant to enable him to bring out a complete illustrated glossary of the Indian indigenous drugs and medicinal plants and for the establishment of a duplicate herbarium of medicinal plants. The recommendations of the Bengal Government have been asked for and will be submitted to the Board on receipt.

3. Col. Chopra's intention is to establish the duplicate herbarium at the headquarters of the Imperial Council of Agricultural Research at Delhi. The Council however does not possess suitable scientific staff for the supervision and maintenance of such a herbarium, nor is it considered possible to accommodate it at the Indian Agricultural Institute at Delhi. It is understood that the Inspector General of Forests, Dehra Dun, will be prepared to accommodate the herbarium in the Minor Forest Products Section of the Forest Research Institute where it will be useful to the staff of the Institute for reference purposes and be open to inspection by any *bona fide* medicinal plant collector or qualified Botanist. The Institute will provide the necessary arrangements for the supervision of the herbarium.

The subject is for the consideration of the Advisory Board.

ANNEXURE

COPY OF LETTER DATED THE 4TH APRIL 1936 FROM LT.-COL. R. N. CHOPRA, C.I.E., K.H.P., I.M.S., OFFICIATING DIRECTOR AND IN-CHARGE, MEDICINAL PLANTS, AND FOOD POISONS INQUIRY, SCHOOL OF TROPICAL MEDICINE, CALCUTTA, TO THE SECRETARY, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH (THROUGH THE LOCAL SELF-GOVERNMENT DEPARTMENT, MEDICAL BRANCH, GOVERNMENT OF BENGAL, AND THE SURGEON-GENERAL WITH THE GOVERNMENT OF BENGAL).

I have the honour to inform you that the first year of the working of the inquiry on the study of medicinal plants and food poisons in India is just over and the report regarding the work done during this financial year is in the

course of submission. As I explained to you verbally when I saw you in Delhi, the work of an extensive enquiry of this kind which comprises the whole of India is in certain respects necessarily very slow. I am now putting before you a scheme by which this part of the work can be expedited for favour of consideration by the Advisory Board.

The first part of my scheme ((Enclosure)) * * * * * * * * deals with the poisonous plants, food poisons and allied conditions. The second part of the scheme is concerned with the investigation of medicinal plants growing in India and encouraging their cultivation. The third part of the scheme is to carry out a systematic study of the present distribution of medicinal plants which are natives of India and the exotics which have been naturalised. A reference to the progress report submitted will show that all these three aspects are being gradually worked out. I now specially wish to draw your attention to the second and third parts, expediting the work of which is very much desirable.

In parts II and III above referred to, the publication of a glossary was mentioned. I pointed out that the literature on the Indian indigenous drugs is old and scattered and much of the material is out of print and not available. Besides that, many inaccurate statements have crept in which might be rectified. The work under this head is very extensive and laborious and should naturally be done with throughness so as to be of practical value. We are working out the localities of availability as exactly as possible and not in vague terms as has been recorded in the literature. For this purpose we have to consult not only all the herbaria existing in different parts of India but also a vast amount of literature in addition to getting in personal contact with workers all over the country. It will be seen that information from these sources will require a large amount of work as nearly 3,000 plants growing in different parts of India are involved. The glossary will thus contain all information regarding the habitat of the medicinal plants, their distribution in nature, cultivation and the essentials of successful cultivation, uses, active principles and references to all latest work. It will, in short, give an accurate and up-to-date account of their scientific and economic aspects. This work when completed will run to over 2,000 pages and will be of great value in determining the extent to which medicinal plants can be brought under cultivation. In fact, what we are aiming at is an up-to-date book on the lines of Watt's "Dictionary of Economic Products of India" dealing only with medicinal plants and food poisons but in a much more comprehensive manner. Absence of such work at present greatly handicaps the research workers and others interested in this subject. The Agriculture and Forest Departments of many provinces and Indian States, and many private individuals are anxious to take up cultivation of drugs and the sooner the stock-taking of the resources of Indian medicinal plants is done, the better it will be from point of view of the advancement of scientific knowledge, the agriculturists and the manufacturers.

In the third part of the scheme, the importance of building up of an authentic herbarium and museum of Indian medicinal plants was emphasised. There are at present herbaria and museums of plants in India, small and large,

but none which satisfies the strict requirements for any advancement on sound lines for matters connected with the medicinal and poisonous plants. For the past two or three years I have been engaged in building up a complete herbarium of medicinal plants growing in India and a museum which will serve as a basis of identification and we have a very large number of specimens collected already. The Botanist of this Inquiry has been collaborating with the staff employed by the School in this work. If the scheme proposed is sanctioned it will be possible to establish a duplicate herbarium of these medicinal plants for the Imperial Council of Agricultural Research at Delhi. I am of opinion that such a collection should be very useful for the activities of the Imperial Council of Agricultural Research.

The Botanist to the present inquiry is already fully occupied with touring all over the country for purposes of collecting specimens, obtaining information, identification of the work, etc., and if he is to deal with the compilation of information on the distribution of medicinal plants as pointed out above, the progress of the work is bound to be slow. It is doubtful if it could be completed during the period of five years for which this Inquiry has been sanctioned. I am, therefore, presenting a small scheme which, without considerable expenditure, would expedite this important work. This scheme consists in employing two compilers at Rs. 100 per month each, who will work under the supervision of the Botanist. They will assist him in hunting up the localities of availability of the medicinal plants from various local floras and journals as well as from herbarium sheets and in arranging and compiling the information received from various sources all over India in which I expect a good deal of work. In addition to the two compilers a whole-time typist will be required so that the preparation of the Manuscript will progress side by side with the work of compilation. This glossary, I consider, will have a very much greater value if it is properly illustrated, at least in respect of important selected medicinal plants. If this view is accepted a whole-time artist will be required and I have provided for one in the scheme, which is given below :—

Estimate of additional expenditure to expedite the work in connection with the scheme for the study of Medicinal Plants and Food Poisons in India.

	Rs.
(1) Two Compilers at Rs. 100 p. m., each for 2 years ..	4,800
(2) One Typist at Rs. 50 p. m. for 3 years	1,800
(3) One Artist at Rs. 150 p. m. for 3 years	5,400
(4) Medical and Surgical requisites and other charges (photographic and artist's materials, etc.) at Rs. 200 per year for 3 years.	600
(5) Contract contingencies at Rs. 200 per year for 3 years ..	600
Total .	13,200

ENCLOSURE.

The scheme for research on food poisons and cultivation of medicinal plants in India.

The first part of the scheme deals with the food poisons and allied conditions. It is well known that there are a number of food poisons, affecting both men and animals in this country about which very little is known. Examples of these are, epidemic dropsy also known as beri beri though the conditions are different, probably due to eating diseased rice ; lathyrism produced by *Lathyrus sativus*, paspalismus (Kodo poisoning) produced by the millet *Paspalum scrobiculatum*, lolismus produced by the millet *Lolium temulentum*, pellagra, etc. Serious damage is done by epidemic dropsy every year in Bengal, there being an epidemic in Calcutta almost every year. The effects produced by lathyrism on the agricultural classes in certain parts of the Central Provinces are well known. In the streets of Calcutta you can see any day hundreds of persons crippled by this disease. They come to the metropolis to earn a livelihood by begging, as they are physically incapacitated to do anything else. The extent of damage in the endemic areas is enormous. There is some evidence that domestic animals such as horses are probably affected and the condition known as 'Kamri', a paralytic condition of the hind limbs, may possibly be of this nature. Although there is considerable evidence in favour of both the diseases being produced by eating improper or adulterated foodstuffs, it is not exactly known how this is brought about ; their prevention, therefore, is still problematical. In the School of Tropical Medicine we have been working for some years and have carefully investigated epidemics of these diseases. Although we have gathered a large amount of information, mainly for want of efficient botanical assistance, the work still remains incomplete. Our first objective will be to try to complete the investigation of these two conditions. At the same time it is proposed to work out some of the allied group of cereal poisons an allergic conditions produced in man and animals by pollens of grasses and plants about which little is known. For instance the non-sweating condition which occurs among horses in Calcutta still remains unworked. It appears probably to be either produced by some weed growing in the grass in the monsoon season which is eaten by the animal, or possibly it may be an allergic condition produced by some pollen. Poisoning of the nature of ergotism have frequently been reported from different parts of India by consumption of such foodstuffs as barley, oats, wheat, etc. The whole of this subject is interesting and is full of possibilities, and it is hoped that a lot of useful work will be done by collaboration between medical, veterinary and agricultural sciences. The advantages accruing from such co-operation will be very great. Apart from goitre and other conditions which occur in both man and animals, there is interrelation between human and animal food deficiency diseases traceable to lack of iron, calcium, iodine, phosphate, vitamin or other essential food factors. The investigation of the conditions which affect both man and animal is a field incompletely explored in this country and it deserves the attention of those responsible for the direction of medical, agricultural and veterinary research.

A large number of plants growing in India contain poisonous principles and many of them give rise to toxic symptoms in man and animal. Very little is known about them. A list of important plants belonging to this category growing in India has been very carefully worked out and is given on pages 558 and 559 of my book "Indigenous Drugs of India". I propose to gradually work out all these plants.

The second part of the scheme is concerned with the investigation of medicinal plants growing in India and encouraging their cultivation. In India on account of its climatic condition, almost all the drugs used in the modern Pharmacopœias grow or can be grown. The country possesses climatic conditions varying from the coldest to the hottest so that the drugs which do not grow within her bounds can be made to do so. Acclimatisation is possible in India to a large extent with almost any plant and it has been amply proved in the case of digitalis, ipecacuanha, cinchona, jalap, etc. There is no reason why the country should not grow every drug to supply her own needs. Inspite of this India imports not only large quantities of prepared medicines, but also crude drugs to the extent of many lakhs of rupees annually. The result is that the price of drugs is so high that it is beyond the means of the masses whose economic condition is low. That is one of the chief reasons why the scientific medicine reaches only less than 20 per cent. of the population. Vast tracts of land exist which could be utilised for the cultivation of drugs in common daily use. Drugs which can be easily grown in India are not grown because it is not known where many of them could be advantageously grown and which particular drug can be profitably grown.

Doubts have been expressed regarding the financial success of large scale medicinal plant cultivation in this country. I feel sure, however, that efforts made in this direction would meet with a great measure of success. In the western countries, a great deal of interest has been taken in the problem. The Bureau of Plant Industry which is a unit of the Department of Agriculture, is fostering plant cultivation and research in America. The State in France is taking a great deal of interest in growing drugs on a large scale. In the report of the Fifth National Congress on the cultivation of medicinal plants in France, held in 1928, it was stated that the culture and collection of medicinal plants in France and the French Colonies has been so extended and so successful that the importation of crude drugs has been materially reduced. The Commonwealth of Soviet Russia and the Hungarian Government are establishing bureaus for carrying on drug cultivation and it is understood that they have achieved some success in their undertakings. In Germany and Belgium, gardens for the cultivation of medicinal drugs and plants, yielding essential oils have proved a great success. Greece has recently taken up in right earnest the cultivation of medicinal plants. In the Far East, Japan has always and is still attending to the cultivation and development of her own drug resources and has never been sorry for it. I understand that the University College, Cork in Ireland is contemplating to establish a special chair for the utilization of the medicinal resources of that country. India has great potential wealth in its home-grown drugs, and this industry only requires the attention of the scientific and industrial workers to develop the vast resources existing.

The Agriculture and Forest departments of many provinces and Indian States, and many private individuals are anxious to take up cultivation of drugs, but are handicapped by the fact that they do not know what to grow and where to grow at present. Persons interested have no means of getting their products tested to know if these are up to standard and effective. It will now be possible to establish the nucleus of an advisory organisation which will be able to help people interested in drug culture with advice. The products grown will be analysed and tested. There is a large team of trained chemists now working in the School and with the addition of another chemist it will be able to cope for the time being with the extra work which will fall on the existing organisation.

It is not the intention of this enquiry to take up experimental growing of medicinal plants. My work on the indigenous drugs has brought me in touch with many individuals and organisations all over the country who will do that part of the work. We will help and guide and encourage them to grow various medicinal plants in suitable places and we will test their products. The data thus collected with regard to the systematic cultivation of medicinal plants will be published and will be useful to others.

In this connection I may point out that we hope to pay attention to the following aspects :—

1. Correct identification and authentication of species of medicinal plants growing in India.

2. Selection of the species with most desirable medicinal qualities.

3. The combination of hardy qualities such as resistance to disease, climate, etc., and the development of these qualities. This was done in case of cinchona and might with advantage be followed in other cases of similar nature.

4. The effect of fertilisers on the quantity and quality of plant constituent.

In all this work close co-operations between the departments of Botanical Survey of India, Forests and Agriculture, will be maintained.

The third part of this scheme is to carry out a systematic study of the present distribution of medicinal plants which are natives of India and exotics which have become naturalised. That undoubtedly is too big a subject for a small organisation such as I have proposed and it was never my intention to do this. Indeed I do not think such a survey is necessary. I have carefully gone through all the available literature and the enormous amount of work done in this connection during the 18th and 19th centuries is wonderful and surprising. For forty years, however, no addition has been made to our knowledge and in this time many new plants have been introduced, and many which were considered to be unimportant and attracted little attention have sprung into prominence. What I

propose to do is to bring the information regarding the distribution of medicinal plants up-to-date and rectify inaccuracies which have been detected. Many facts in connection with the distribution, etc., of plant like ephedra, artemesia, digitalis need investigation. The services of a whole-time systematic botanist will enable us to do this work. My great difficulty with the indigenous drugs and food poison work has been on the botanical side. The identification of botanical specimens has been difficult and we have sometimes been misled. The Botanical Survey have always helped us, but they are short-handed and have no one who has specialised in this particular subject; things are often apt to be delayed. The appointment of a botanist, who will become specially trained in this class of work, will enable us to collaborate better with the Botanical Survey. He will travel and get into direct touch with different parts of the country.

The work when completed will be published in form of an up-to-date glossary of Indian medicinal plants giving information regarding their habitat, distribution, uses, active principles and references to all the latest work. The literature on the Indian indigenous drugs is old and scattered and much of the material is out of print and not easily available. This greatly handicaps the research workers and others interested in the subject. The glossary I propose to prepare will give all the information required by those interested in the subject and a lot of spade work has already been done. At the end of my book "Indigenous Drugs of India" there is a list of over 2,000 medicinal plants, containing about 500 more names than any single existing publication on the subject. We have already added to this list, but much more has to be done. The utility of such a work from the scientific and economic points of view cannot be doubted. It will contain all the information regarding medicinal plants which is required by those interested in them from the scientific and economic sides.

The difficulty of identification of medicinal plants is also important from point of view of this research. The drugs to be dealt with are many in number and varied in character, etc. Many of the remedies mentioned in old books baffle and defy recognition and identification and one cannot be certain from the description whether the specimens obtained are of the particular drug described. The result is that there has been a good deal of confusion and I have come across different herbs being sold in different provinces under exactly the same name. This enquiry will build up a complete herbarium of medicinal plants growing in India which will serve as a basis for identification. This work was started some years ago but for want of expert botanical assistance little progress has been made. A considerable amount of spade work has however been done and it is hoped that before long a complete herbarium comprising of nearly 3,000 medicinal plants, mentioned in the literature will be collected and will be available.

Such briefly are the lines on which I propose to work, and if the Council has any other suggestions to make I shall be very glad to consider them.

APPENDIX XLVI.

Note by the Secretary, Imperial Council of Agricultural Research, dated the 25th June 1936, on Subject No. 33 :—Application from the Government of Madras for a subsidy of Rs. 63,900, spread over three years to the Kerala Soap Institute, Calicut.

Attention is invited to the attached application from the Government of Madras (Annexure) for a subsidy of Rs. 21,300 per annum for a period of three years to the Kerala Soap Institute, Calicut. The grant has been asked for on the analogy of the financial assistance rendered by the Council to the Oil Section of the Harcourt Butler Technological Institute, Cawnpore, during the years 1934-37. As no oil-seed cess is contemplated at present the Advisory Board in February 1936 recommended that the grant to the Harcourt Butler Technological Institute should be sanctioned for 1936-37. The Governing Body have approved this proposal. The proposal of the Madras Government now appears to be a matter for the Industrial Research Council.

The subject is for the consideration of the Advisory Board.

ANNEXURE.

COPY OF LETTER NO. 240, DATED THE 18TH FEBRUARY 1936, FROM THE SECRETARY TO THE GOVERNMENT OF MADRAS, DEVELOPMENT DEPARTMENT.

(Conversion of the Kerala Soap Institute, Calicut, into an Oil Technological Institute.)

I am directed to forward a scheme for the conversion of the Kerala Soap Institute, Calicut, into an Oil Technological Institute, submitted by the Director of Industries (Enclosure), for the consideration of the Imperial Council of Agricultural Research. I am to state that the facilities afforded by the research and instructional side of the institute will be placed at the disposal of the Governments of Bombay, Hyderabad, Mysore, Travancore and Cochin, and students will also be admitted from these areas on equal terms. The number to be admitted will be fixed in consultation with the Imperial Council of Agricultural Research. The scheme will, therefore, be for the benefit of the whole of Peninsular India.

2. The Kerala Soap Institute will, under the existing sanction, be retained till the end of March 1938. It is proposed to ask for a subsidy of Rs. 21,300 per annum from the Imperial Council of Agricultural Research for a three years' programme. If the Council agrees to grant the subsidy asked for, the question of continuing the experiments at the institute beyond 31st March 1938 will be considered before the expiry of the current sanction.

3. The scheme was placed before the Provincial Research Committee which has recommended it to the Imperial Council of Agricultural Research. One hundred and fifty copies of the scheme are being forwarded separately.

ENCLOSURE.

Scheme for the conversion of the Kerala Soap Institute, Calicut, into an Oil Technological Institute.

The Madras Presidency occupies a very important place in India as a producer and exporter of oil seeds of various kinds, those most commonly cultivated in the Presidency being groundnut, cocoanut, castor, gingelly and cotton seed. Although oil seeds are of great economic importance to the Presidency, owing to the variety of the seeds and the extent of their production, only a very small percentage of the annual production of oil seeds is converted into oil locally, the greater portion being exported to foreign countries. The average export of seeds from British India during the three years ending 1934 was 957,442 tons, valued at Rs. 12,63,71,276 ; the Madras share was 472,258 tons valued at Rs. 6,12,07,275. It will thus be seen that this Presidency occupies the premier position and exports more than half the total quantity of oil seeds exported from India. The annexed statement I, showing the production of oil seeds in India further illustrates the predominant position of Madras which accounts for almost a third of the whole Indian production.

The exploitation, to the greatest advantage of the vast oil seed resources of the Presidency depends on the setting up of efficient oil mills and of factories utilizing vegetable oils as a raw material, such as soap factories and factories for the manufacture of vegetable fats on a large scale. An increased internal demand for vegetable oils for industrial purposes would also assist to maintain the price of the seeds. At present, owing partly to the world wide trade depression and partly to the increasing competition which Indian oil seeds are meeting from marine and vegetable oils from other countries, the price level of oil seeds has seriously declined to the detriment of the Indian primary producers whose purchasing power has declined to a marked extent. In addition to the oil seeds of chief economic importance there is a large number and variety of lesser known oil seeds grown in different parts of this Presidency of which no statistics are compiled either of production, export or consumption in the country. They include *maroti* (*Hydnocarpus weightiana*), *Punna* (*Calophyllum inophyllum*), *Mowrah* (*Bassia longifolia or latifolia*), *Pongam* (*Pongamia Glabra*), *margosa* (*Melia Azadirachta*), *Dhupa* (*Vateria indica*), *macassar* (*Schleichera Trijuga*), Ganja seed (*Cannabis indica*), jungle castar (*Patropa Curcas*), etc. The conclusion that emerges from a study of the vegetable oil resources of the Presidency is that an oil technological institute should be maintained by Government in order to develop such resources—present and potential—to the utmost. The development of the oil seed crushing industry and the utilization of vegetable oils for various technical purposes is in fact of vital importance to this Presidency, as also to the Provinces and States which border it. Bombay ranks second only to Madras as an oil seed producing Province, whilst the production of oil seeds in the Hyderabad State is very considerable. Travancore and Cochin are of course large cocoanut growing areas.

Realising the importance of utilizing the oil industry, Government sanctioned, early in 1916, Sir Frederick Nicholson's proposals for establishing a small factory for the experimental manufacture of soaps. In 1917, Sir Frederick Nicholson submitted proposals for the establishment

of a factory in permanent buildings of its own. His object was that the factory with its chemists and laboratory should constitute a technological institution where other branches of the oil and fat industries could be studied and demonstrated. It was intended that the Government factory, besides serving as a stimulus to small capitalists to establish similar factories, should also provide facilities for the training of students in the processes employed ; in other words, the object of the soap factory was to establish soap manufacture and to demonstrate that soap could be made profitably in this Presidency, and at a later stage it was intended to train students in soap manufacture up to the limits of the factory accommodation and equipment.

The Kerala Soap Institute has been now for some years working as a commercial concern designed to yield a profit on the capital invested so that the right kind of private enterprise might be induced to take up small ventures. The institute has demonstrated that soap can be made at a profit. It has worked at a profit after allowing for interest on capital and depreciation on land, buildings and machinery. Instruction is also given in soap making. The course lasts for a year. Twelve students are taken annually and they are required to pay a fee of Rs. 100 per annum if they belong to this Presidency and Rs. 150 in the case of others. The course of training imparted is both theoretical and practical, and is adapted to the requirements of men with small capital and no great education. Most of the students seem to turn to good account the training and experience they receive in the institute. There is no statistical information available as to the number of small factories which have sprung into existence in the Presidency as a result of the education and training imparted in the Kerala Soap Institute, but there is reason to believe that the number of such factories is well over 100. It is believed that the Kerala Soap Institute is the only institute in India where practical training is imparted in a factory equipped with modern plant and supervised by an expert. The applications for admission from all over India are large, but many have to be refused admission owing to the limited accommodation, admissions to the full course being restricted to 12. Besides, there is a short course and three or four students are taken for this course. The fact that there has been a demand for admission to the courses of training in the institute, although no scholarships or stipends are awarded and fees are levied, may be taken as an indication of the desire on the part of the public to avail themselves of the instructional facilities afforded by the institute. The institute maintains close touch with ex-students who have completed their training and their requests for advice and assistance are readily attended to. The Superintendent also pays periodical visits to the factories and oil mills in the Madras Presidency and advises the proprietors how to overcome any technical difficulties or how to improve the processes employed with a view to turning out a satisfactory product at a competitive price. In the laboratory samples of soaps and allied products, many of which are collected by the Superintendent during the course of his tours, are analysed. More recently experiments have also been undertaken in refining and deodorizing vegetable oils. The experiments on refining of oil has been a success. But the work done hitherto in the institute in developing the oil industry is very small compared with the work remaining to be done. The scope for experimental research work in vegetable oil technology is indubitably very great. Items of research work which could

suitably be undertaken in an Oil Technological Institute serving the needs of Southern and Western India are suggested in the following paragraphs :—

(*i*) India imports annually over one crore of rupees worth of vegetable ghee and vegetable fat, most of which is consumed as edible fat or a substitute for ghee. Though America, Europe and Japan have perfected commercial processes of hydrogenation or hardening of oils and are operating a number of plants, it is only recently that some attempts have been made in India to establish factories for hardening oils. With the advent of cheap electric power, an all-important factor in the economic production of hydrogen, there should be scope for the setting up of at least one large factory in the Madras Presidency, for there should be a steady and growing demand for the hardened fats both for use in the manufacture of toilet soaps and as a suitable substitute for ghee. Local tallow is of very indifferent quality and is extremely wasteful to refine, while the quantity available is neither steady nor sufficient. On the other hand, tallow, imported from Australia, New Zealand and England is very expensive. Soap manufacturers in India, who have to use at present an expensive tallow for high class soaps are, therefore, placed at a disadvantage in competing with soap-makers in Europe. An assured and cheap supply of a tallow substitute prepared from vegetable oils in this country would give a decided impetus to the development of the toilet soap industry. At present pure ghee is not available in India in sufficient quantities and the price is very high ; while most of the bazaar ghee is unwholesome and grossly adulterated, often with deleterious substances. The production of a cheap ghee substitute in India therefore is much to be desired. The importance of this question has been appreciated by the Government and experiments have been initiated at the institute on the refining, deodorizing and blending of oils, etc., with a view to placing accurate data before firms interested in developing this industry. The carrying on of these experiments will, however, involve in all probability increased recurring and non-recurring expenditure over a period of years.

(*ii*) There is a strong case for the initiation of experiments on the manufacture of essential oils. There is a large variety of essential oil yielding materials in the Presidency, particularly on the West Coast and in adjacent districts. The forest areas contain several species or odoriferous roots, gums, herbs, leaves and flowers, many of which have not so far been brought under examination by any chemical laboratory in India or investigated in a scientific manner. There seems no doubt that experimental research would bring to light the economic value of many of these less known and neglected products, and there appears to be ample scope for the setting up of distilling plants for the extraction of essential oils, not only for use in the local manufacture of soap but also for

export. If an essential oil distillation plant is set up at the institute the exploitation of new sources of raw materials for conversion into perfumes can be undertaken. The object of the experimental plant would be to demonstrate the practicability of turning out the various essential oils in commercial quantities and at a commercial price, while the possibilities of converting some of the essential oils into subsidiary products such as scents, handkerchief perfumes, hair oils, cosmetics and scented sticks could also be investigated.

(*iii*) The experiments at the institute on the refining and deodorizing of oils and fats require to be extended and developed. There is a large demand in India for deodorized oils. Certain of the vegetable oils have a flavour characterristic of the seeds from which they are crushed, and in some instances the original flavour requires to be removed. The semi-solid fats, such as *dhupa* fat and *iluppa* fat, at present command only a very limited market as they are unfit for edible purposes in their natural state, but if they are refined and deodorized their value will be considerably enhanced. As is well known, most of the vegetable oils produced in the country oil-mills and sold in the bazaar are heavily contaminated with dirt, impurities and foreign substances which render them unsuitable and injurious for edible purposes. These oils, if refined, can be improved in quality and cheap but good class oils brought within the reach of the public. The oils that are proposed to be treated in the oil refining plant in the institute are—

(*a*) groundnut oil,

(*b*) cocoanut oil,

(*c*) Sesame oil, and

(*d*) *Iluppa* oil (*Bassia Longifolia*).

(*iv*) Experiments on castor oil with a view to its use as medicinal oil, Turkey red oil and lubricating oil, etc. Part of the castor oil exported from India comes back to the country in some of these forms. It should be possible to convert castor oil into the various technical products so that they may be available at a cheaper price than the imported articles.

(*v*) *Manufacture and refining of fish oil, guano and fish meal, etc.*—Fish oil is manufactured from the sardines which frequent the West Coast and as Calicut is the centre of the fishery industry and contains Government fish curing yards and private oil and guano factories, it is the obvious centre for the carrying on of this work. The institute has the necessary equipment for testing fish oil and also for refining it and the Superintendent, who was originally employed as Oil Expert at Tanur Research Station, has considerable experience of the manufacture of fish oil and guano.

(*vi*) Manufacture of paints and varnishes.

(*vii*) Fat splitting and recovery of glycerine.

(*viii*) Cashewnut (*Anacardium Occidentale*) is grown extensively in Malabar, South Kanara, Cochin and Travancore, but the oil

expressed from the shell by crude methods in the process of roasting the nut for extracting the kernel is often charred and rendered useless for export purposes. Cashew shell oil is exported under the trade name of ' Cardole oil ' to America where it is largely used in the manufacture of plastic and moulded articles such as Bakelite and also in the preparation of paints and varnishes. There is great scope for developing this industry on the West Coast.

(*ix*) A large quantity of lubricating and batching oils and greases is imported and consumed in India. There is in this Presidency a large variety of semi-solid vegetable oils such as *Illuppa oil, pungam oil (Pongamia glabra) and also castor oil* which could be blended so as to make high class lubricating and batching oils. It would be necessary to import a small percentage of mineral grease from Burma to produce lubricating greases which could compete with this variety on the market.

If the Kerala Soap Institute is converted into a technological institute, small unit types of oil mills should be set up for instructional and demonstrational purposes, while the number of apprentices could be appreciably increased. Few data are available as to the relative efficiency and suitability of the various types of oil mills for dealing with different classes of oil-seeds and the necessary trials and experiments could with advantage be carried on in the institute.

Most of the experiments referred to above could be taken up only with the assistance of a grant from the Council of Agricultural Research, as the amount of money which the Local Government is able to provide for the institute is necessarily limited. In the absence of any assistance for research from the Council of Agricultural Research, it is possible that sooner or later the commercial side of the institute will be handed over to private enterprise for further development, in which case it is doubtful whether facilities will continue to be available in the Madras Presidency for the conduct of research in the field of oil technology. With a grant from the Imperial Council of Agricultural Research it will be possible to continue the institute in its present state and make it available for further experiments.

The institute will under existing sanction be retained till the end of March 1938. If the Council agrees to make a subvention, it is proposed to carry on experiments during this period and, if the experiments are successful, the question of continuing them will be considered at the end of this period. Statements II and III appended show the experiments proposed to be undertaken during the next three years and the expenditure likely to be incurred. Appended statements IV, V and VI show the allocation of the expenditure among the various experiments during the first three years. The details of general charges are exhibited in statement VII. It will be observed from the statements that the experiments are likely to cost on an average Rs. 21,300 per annum. A grant to this extent is now sought from the Imperial Council of Agricultural Research.

The Madras Government is aware that the Imperial Council of Agricultural Research has given a subsidy of Rs. 30,000 to the Oil Section of the Harcourt Butler Technological Institute, Cawnpore, during 1934-35